THE PLANNING ACT 2008

M4 (JUNCTIONS 3 TO 12) (SMART MOTORWAY) DEVELOPMENT CONSENT ORDER APPLICATION

TR010019

Written Summary of Issue Specific Hearing Dealing with Matters Relating to Environment

Date: Tuesday 17 and Wednesday 18 November 2015, 2pm

Venue: Radisson Blu Edwardian Heathrow Hotel, 140 Bath Road, Hayes, Middlesex, UB3 5AW

WELCOME AND INTRODUCTIONS

The Examining Authority began by making introductions and explaining the purpose of the hearing.

A. PRELIMINARY MATTERS

1. Establishing the baseline for the Environmental Impact Assessment (EIA): to what extent is the methodology agreed with consultees and interested parties (IP)?

Highways England Response

1.1 Highways England noted that no parties raised any objections, when asked, to the methodology of the EIA. The London Borough of Hillingdon highlighted that it had an issue with the methodology behind air quality, but not specifically with the basis of the EIA.

2. Has the list of projects which is included within the cumulative impact assessments (Environmental Statement (ES) Appendix 16.1 and 16.2) been agreed with statutory consultees? APP-356 and APP-357

Highways England Response

2.1 Highways England undertook a two-phase process to identify the projects to be included in the cumulative impact assessment. The first phase, completed by February 2014, concerned the identification of projects to be included in the traffic forecasting, and from that the cumulative effects on air quality and noise due to forecast traffic flows. The second phase, completed by January 2015, concerned the identification of projects on the local authority planning portals within 1 km of the Scheme to be included in the cumulative impact assessment for the non-traffic related impacts (landscape, ecology, cultural heritage, etc.).

2.2 The Planning Inspectorate, in the Scoping Opinion issued in September 2014, advised that the cumulative effects assessment should consider major developments in the area that are:

2.2.1 under construction;

2.2.2 permitted application(s) not yet implemented;

2.2.3 submitted application(s) not yet determined;

2.2.4 all refusals subject to appeal procedures not yet determined;

2.2.5 projects on the National Infrastructure Planning portal's programme of projects; and

2.2.6 projects identified in the relevant development plan (and emerging development plans – with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited.

2.3 As stated in paragraph 16.3.2 of the ES (Application Document Reference 6-1), a list of proposed developments to be considered in the assessment of cumulative effects was compiled through searches of local authority planning portals for planning applications; a review of allocated and proposed sites in local plans; consultation responses on the Environmental Impact Assessment Scoping Report; the Planning Inspectorate's Scoping Opinion and direct consultation with local authorities whose areas are predicted to be affected by the Scheme. Rejected planning applications that are not subject to appeal were not considered as their implementation was not considered to be reasonably foreseeable.

2.4 As explained in Highways England's response to Question E4.7.11, the various local planning authorities were contacted between December 2013 and January 2014 to establish the then current position in respect of relevant planning proposals in preparation for undertaking the forecasting stage of the M3/M4 traffic model development. The position was frozen in February 2014 to enable the finalisation of the model zones and the generation of the respective development trip rates for inclusion in the model, followed by the air quality and noise assessments. The list of developments included in the traffic model is summarised in Appendix 16.2 of the Environmental Statement ("ES") (Application Document Reference 6-3).

2.5 In December 2014, a letter was circulated to relevant local planning authorities along the Scheme which included a list of developments identified on each of the local authority planning application websites. Responses received provided additional developments for consideration and/or provided updated details on developments already identified. Those additional developments that fell within the 1km study area were considered using the criteria set out in paragraph 2a) to f) above. The developments considered within the cumulative assessment (as of January 2015) are listed in Appendix 16.1 of the ES (Application Document Reference 6-3). The locations of the developments are presented on Drawing 16.1 (Application Document Reference 6-2). As there was a freeze on developments considered in the traffic model in February 2014 to allow the traffic modelling to be undertaken, new applications identified after that date were only considered for non-traffic related cumulative impacts (landscape, cultural heritage, nature conservation, etc.).

2.6 Following submission of the DCO Application in March 2015, Highways England has undertaken further consultation with the local authorities to discuss residual matters, including the list of developments in the cumulative impacts assessment. Several statutory consultees, have queried the exclusion of certain developments, notably:

2.6.1 Heathrow third runway.

2.6.2 HS2 Heathrow Express Sidings.

2.6.3 Western Rail Link to Heathrow.

2.6.4 Slough International Freight Exchange (see 'Section A – Preliminary Matters' Question 3 below)

2.7 As explained in the response to Question 4.7.12 from the Inspector's first round of questions submitted for Deadline II, it is considered that it is premature to undertake a cumulative assessment of projects which are still in the development stage and are not committed developments. This applies to Heathrow third runway, HS2 Heathrow Express Sidings and West Rail Link to Heathrow.

2.8 In the Statement of Common Ground between South Bucks District Council and Highways England, the Council does not agree to the exclusion of Heathrow third runway, the HS2 link to Heathrow, and Western Rail Link to Heathrow from the cumulative impacts assessment. In the Statement of Common Ground between Buckinghamshire County Council and Highways England, the Council does not agree to the exclusion of the HS2 link to Heathrow and the Western Rail Access to Heathrow.

2.9 Highways England confirms that most of the relevant stakeholders agree to the list of developments included in the cumulative impact assessment, or at least, they have not disagreed. Where disagreement remains, Highways England considers that the developments are not sufficiently well defined to be considered committed developments and hence be included in an assessment of cumulative effects.

2.10 In response to comments and questions raised by the London Borough of Hillingdon and the Examining Authority, Highways England confirmed its position on the assessment of HS2. HS2 is still in the process of going through Parliament and has not yet received a recommendation. There is long process that the project must go through before it is even confirmed and it was therefore not considered as a "committed development". This reflects guidelines that Highways England abides by when it makes a judgement on what projects

should be included as part of the cumulative impact assessment. A date has to be decided upon by which projects have to be confirmed in order to be considered as "committed". In the present case, Highways England elected for February 2014. HS2 was not in the committee process at that point, when the environmental impact assessment was undertaken.

2.11 For similar reasons to those that apply to HS2, Western Rail Link and HEX have also not been included in the cumulative impact assessment. The earliest possible date for a DCO for Western Rail Link is March 2016 and the earliest construction commencement date for HEX has been pushed back to 2019. There is a significant period of time to run before either project is either approved or construction is begun.

2.12 Highways England provided some clarity by confirming that there were two stages to the process. Stage one covered the large area required for traffic modelling and, at stage two, a 1km boundary around the Scheme was defined to form the area for cumulative assessment of the environmental effects. This is explained in paragraph 16.3.11 of the ES. Projects outside of this 1km radius are not considered as part of the cumulative impact assessment for environmental effects but are considered for inclusion in the traffic model (stage one). Highways England agreed to supply to the Examining Authority a map showing the broader area looked at for stage one as well as the localised impacts within 1km of the Scheme. The attached explanation will make clear the distinction between projects included in the assessment and those left out.

3. The Goodman Colnbrook Strategic Rail Freight Interchange (SRFI) application is currently before the Secretary of State (SoS) as an appeal. If the SoS was to grant planning permission, how would that project affect Highways England (HE)'s assessments of road traffic, air quality, noise and any other impacts for the M4 scheme?

Highways England Response

3.1 In developing the transport model for the M4 scheme, described in the Traffic Forecasting Report (which was provided at Appendix 1 to the Response to Relevant Representations submitted at Deadline I), the principles of TAG Unit M4, Forecasting and Uncertainty, were applied. In particular, the guidance in Section 2.2 on the creation of an uncertainty log was used to determine which development proposals should be incorporated into the core or other test scenarios. With respect to the particular case of the SIFE development, the application had been refused in 2011 (prior to the forecasting stage for the M3/M4 traffic model) and, given its green belt status in the Slough Local Plan, it was excluded from consideration in the forecast process. Following completion and sign-off of the model and its application to the appraisal of the Scheme, it is not a requirement within TAG to retrospectively assess

developments that subsequently receive planning consent. Consequently, the potential grant of consent following the current appeal process would have no effect on the assessment of the Scheme.

3.2 However, if the SoS was to grant consent and the modelling for the M4 scheme required to take account of SIFE, the first step would be to abstract details of the traffic movements from the applicant's Transport Assessment ("TA") (Slough International Freight Exchange, Transport Assessment, 2010) and apply the appropriate volumes (from Tables 8.2 and 8.3 of the TA) and trip distributions (from Tables 8.4 and 8.5 of the TA) to each of the model's time periods. In addition, the mitigation measures described in chapter 11 of the TA would be coded into the model's highway network.

3.3 In summary the 24hr total movements are stated as:

3.3.1 Light Vehicles – in: 1776; out: 1801 vehicles per day

3.3.2 HGVs – in: 1615; out: 1615 vehicles per day

3.4 It is noted that the HGV movements are subject to a routeing agreement and, as such, this could be taken into account in assigning the vehicles to the highway network within the model.

3.5 The process for the explicit modelling of specific development proposals is set out in section 4.10 of the Traffic Forecasting Report (Alternative Planning Assumptions Approach) whereby growth associated with local developments can be taken into account within the National Trip End Model ("NTEM") forecasts used as the basis for the traffic model forecasts. In essence this allows for the employment associated with the development to be netted out from the NTEM forecasts totals to avoid double-counting of the forecast trips.

3.6 The net totals of additional trips associated with the development could then be incorporated into the 2022 and 2037 model runs for both Do Minimum (without Scheme) and Do Something (with Scheme) scenarios and the resulting AADT and 18hr AAWT total flows for each scenario passed over for subsequent environmental assessment.

3.7 The air quality assessment for the SIFE scheme (2015 Addendum, based on Defra predictions) identified a maximum increase in annual mean concentration of NO_2 at sensitive within their study area of +1.1 µg/m^3 in their assessment year of 2020 (at 100% operation). The highest predicted concentration of annual mean NO_2 in the M4 Scheme assessment at sensitive receptors near junction 5 (those potentially affected by SIFE) is 37.7 µg/m^3. If this

additional increase from SIFE was added to the predicted concentrations in 2022 for the Scheme, then the highest concentration would be 38.8 µg/m^3, which is below the air quality objective of 40 µg/m^3. It is therefore not envisaged that this would lead to annual mean concentrations above the objective value around junction 5 or to the Scheme having a significant effect on air quality.

3.8 The additional traffic (due to operation of the SIFE) on the M4 and feeder roads to Junction 5 appears in the Do Minimum and Do Something scenarios. Given the existing high traffic flows on the M4 and the estimated traffic generated by the SIFE, the change in noise levels, Do Minimum to Do Something, with this additional traffic will be comparable to that assessed in the Environmental Statement. Consequently, it is unlikely that the conclusions of the noise assessment will change.

4. In response to First Round Questions (FRQ) PD-005 E4.7.13 South Buckinghamshire District Council (S Bucks DC) raised the potential disruption which would arise if the construction of other projects (such as Heathrow Express depot, and Iver Relief Road) takes place at the same time as the M4 scheme. Has any consideration been given to cumulative impact which may arise from a combination of developments taking place in one area at the same time?

Highways England Response

4.1 The proposal to relocate the Heathrow Express depot to a site at Langley is contained within the Additional Provisions 2 bill for HS2 submitted to Parliament in July 2015. Subject to the receipt of Assent in December 2016, works would commence in June 2017 and are scheduled to complete in July 2019. It is understood that the construction traffic associated with the depot relocation would make use of M4 junction 5 at Langley.

4.2 The works associated with the construction of the M4 Smart Motorway at junction 5 are scheduled to take place between mid-2018 and mid-2019 and accordingly it is acknowledged there is the potential for a cumulative impact. However, there would be a reasonable expectation that the activities that would require road transport such as the site clearance for the depot and main construction would take place at the front end of the construction sequence, i.e. 2017-2018. As such, it would appear there is the potential to keep the period of potential conflict to a minimum. Highways England has had earlier discussions with Heathrow Express and proposes to maintain dialogue.

4.3 Following a meeting with Buckinghamshire County Council on 11th November 2015, the Council has advised that the proposal for an Iver Relief Road is at an early stage of consideration and currently has no formal planning status. This being the case, it is not possible to provide a more definitive response at this stage. Highways England proposes to

continue liaison with both S Bucks DC and BCC (as local highway authority) on their issues of concern.

5. *Construction Environmental Management Plan (CEMP) – now that a contractor has been identified to construct the scheme if consent is given (response to FRQ 4.2.7 REP2-02), can the CEMP be revised to include more detailed provisions? In particular can the concerns of London Borough of Hillingdon (LB Hill) re Construction Compound 11 be addressed?*

Highways England Response

5.1 The Construction Environmental Management Plan ("CEMP") has recently been updated and will be further updated during the detailed construction planning stage. The CEMP is a live document and, as such, will be updated during the project lifecycle, with each update adding more detailed, specific information as the Scheme progresses.

5.2 With regards to Construction Compound 11, the issues raised by LB Hillingdon throughout the Examination period appear to include the selection process for the compounds, the specific use of Construction Compound 11 and the associated impacts of using that compound (i.e. traffic, noise, environmental pollution and ecology impacts).

5.3 Paragraphs 4.3.26 and 4.3.27 below were provided in response to the Stockley Road Compound (Construction Compound 11) comments outlined by LB Hillingdon within their Local Impact Report:

4.3.26 This proposed Construction Compound is located at the Prologis Park off the A408 (paragraph 8.2.5(i) of the Engineering and Design Report (Application Document Reference 7-3)), adjacent to junction 4 at the east end of the project. The compound (2.0ha in area) would be utilised for the recovery service during the highway works for the eastern section of the Scheme between junction 8/9 and junction 3. It would also be used to store the various materials associated with the bridge and highway works. This would include drainage, plant and materials, safety barriers and traffic management equipment.

4.3.27 Consequently it is proposed that the compound would be operational throughout the period of construction and commissioning of the M4 between junction 8/9 and junction 3. As part of the Construction Traffic Management Plan traffic management plan the routing and delivery of materials to this compound would be addressed. Routing of vehicles to the compound from the south will use the M4 junction 4 and turn north onto Stockley Road. Vehicles will proceed north to the roundabout adjacent to the golf club where they will do a 180 degree turn and proceed southwards back towards the motorway junction. The vehicles will then enter the compound with a left turn. This will ensure that construction traffic and deliveries impact on the local network is minimised. Highways England's contractor will discuss all routes for construction traffic with London Borough of Hillingdon during the detailed planning of the construction works. Please refer to 13.8.1 within the CEMP which details the approach and consultation that will be adopted when considering access and egress routes to and from site.

5.4 Section 6 and 12 of the outline CEMP provide details of the measures identified for mitigating any potential air quality and noise impacts, respectively, that may arise from the use of Construction Compound 11. Section 9 of the CEMP outlines the approach to be used by the contractor to mitigation any impacts on ecology. As stated above the CEMP will receive further updates as more detail is finalised regarding the Scheme's construction mitigation requirements.

5.5 Highways England confirmed that an updated CEMP was submitted at deadline III (5 November 2015) and that at least one more version would be submitted before the end of the Examination. The CEMP submitted with the Application is an outline version that is developed on an on-going basis, with a final version being put into effect through requirement 8 in the DCO.

B. TRAFFIC FORECASTING

1. Are the traffic forecasts reported in the Highways England Traffic Forecasting Report for the M4 Smart Motorway (dated October 2014 and submitted at Deadline I REP1-003, Doc 3 Appendix 1) based on the most up to date methodologies - National Transport Model and National Trip End Model - in accordance with Department for Transport (DfT) Road Traffic Forecasts 2015 (dated March 2015)?

Highways England Response

1.1 The traffic forecasts for the M4 Smart Motorway were developed during 2014 and, as such, predate the issue of Road Traffic Forecasts 2015, which were published in March 2015. Both the model used to develop the Road Traffic Forecasts 2015 (the National Transport Model) and the M4 Smart Motorway model use data from the National Trip End Model. The M4 Smart Motorway model used data from the National Trip End Model version 6.2. It is to be noted that the footnote to Paragraph 1.18 of the Road Traffic Forecasts 2015 states:

1.1.1 "An update to NTEM is scheduled for early 2016 which will consider the latest evidence on trip rates. For the avoidance of doubt scheme promoters should continue to use NTEM v6.2 until the update is ready for use, taking into account the guidance under the WebTAG Proportionate Update Process."

1.2 Accordingly, the forecasts for the M4 Smart Motorway have been developed in accordance with Departmental guidance on current required practice.

2. Re Section 1.5 of the DfT Road Traffic Forecasts 2015 report, it is stated that the forecasts in the DfT report should not be used to appraise individual road schemes, nor should they be used to consider the right level of capacity on a specific road or solutions to specific local issues. DfT goes on to state that analyses of specific schemes are expected to use bespoke models fitted to local conditions to inform decisions. What then is the relationship between the model used in the DfT Report and the model used for the M4 Smart Motorway?

Highways England Response

2.1 The model used in the DfT Report is the National Transport Model (NTM). As stated in paragraph 1.12 of Road Traffic Forecasts 2015:

2.1.1 "The NTM covers the whole of Great Britain and is the Department's primary tool for forecasting national road traffic."

2.2 And further in paragraph 1.3 that traffic forecasts derived from it are used:

2.2.1 "in investment appraisal to understand the combined impact and value for money of packages of schemes across the whole network using the National Transport Model (NTM)"

2.3 The NTM is actually a suite of programs and at the heart of the NTM is the National Trip End Model, which is described in paragraph 1.10 of Road Traffic Forecasts 2015 as follows:

2.3.1 "The starting point for our forecasts is the National Trip End Model (NTEM) dataset and suite of models which is the basis for forecasting multimodal demand. This provides an initial forecast of travel demand for all modes and is based on evidence and research, gathered over many years, which can be used in bespoke transport models."

2.4 As stated in response to 'Section B – Traffic Forecasting' Question 1, the M4 Smart Motorway model uses NTEM as the basis of its forecasts. The key point is that by using data from a single source (NTEM), both the National Transport Model and any number of bespoke models covering part of Great Britain (as the M4 Smart Motorway model does) are consistent in their respective approaches. This removes the potential for bias in the growth forecasts and distortion of the business cases between schemes, which is essential if the Department is to correctly prioritise schemes within the national budget.

3. Were the methodologies developed by the same contractors, or at least in a consistent manner?

Highways England Response

3.1 The National Transport Model and National Trip End Model were developed by consultants WSP, working on behalf of the Department for Transport. The M4 Smart Motorway model has been developed by two consultants. AECOM developed the variable demand element and Mouchel Consulting has developed the highway assignment model.

3.2 Consistency has been achieved through the use of the DfT's Transport Analysis Guidance (TAG). The M4 Smart Motorway model has been developed in compliance with the guidance set down in TAG.

4. *Re Section 2.13 of the DfT Road Traffic Forecasts 2015 report, which summarises changes made to the forecasting approach between 2013 and 2015, has the M4 Smart Motorway modelling taken account of these changes in its forecasting approach?*

Highways England Response

4.1 Paragraphs 2.4 to 2.13 of NTF2015 describing the *"improvements to our forecasts"* are summarised as follows:

4.2 "Summary of changes to the forecasting approach:

4.2.1 The introduction of a forecast scenario in which income growth does not result in rising car travel for comparison with other scenarios where increased income increases car ownership and car travel.

4.2.1.1 The introduction of a forecast scenario where the past trend in trip rates has been extrapolated forward to 2040 for comparison with the other scenarios where trip rates have been held constant from 2010.

4.2.1.2 Update to the speed and capacity of the London road network to reflect observed data.

4.2.1.3 Update of fuel price, fuel efficiency and GDP forecasts.

4.2.1.4 Update to the capacity of the road network to reflect the December 2014 Road Investment Strategy."

4.3 In considering this question, the key point is that the 2013 version of Road Traffic Forecasts (which was current at the time the forecasts for the M4 Smart Motorway model were commencing development) produced a range of outcomes – a central forecast, together with higher and lower outcomes reflecting assumptions on population, GDP per capita and oil price. These principles remain at the heart of the latest 2015 forecasts, with its Scenario 1 being analogous to the 2013 central forecast and Scenarios 4 and 5 reflecting *"high"* and *"low"* variants of Scenario 1. The M4 Smart Motorway model core scenario is in line with the assumptions underlying RTF 2015 Scenario 1.

4.4 The changes summarised in the first two points above describe additional scenarios introduced by the DfT in response to its research findings and reflect the possibility that some of the historic drivers for car ownership and use are shifting in response to changes in attitudes and behaviours. The introduction of these additional scenarios does not invalidate

the earlier assumptions – they merely reflect uncertainty. The previous scenarios, and the assumptions underlying them, remain as possible outcomes.

4.5 The update of the speed and capacity of the London road network in the National Model reflected the effects of the congestion charge and reallocation of road space in favour of buses. The M4 Smart Motorway model does not rely on these forecasts as it has been separately validated against observed data.

4.6 The update of fuel price, fuel efficiency and GDP forecasts is a regular, usually annual process. Whilst GDP forecasts principally feed into NTEM, the forecasts themselves are subject to occasional updates (the current version, NTEM v6.2 was published in 2011). The impacts of changes to fuel price and fuel efficiency feed through to vehicle operating costs, which in turn affect the modelled cost of travel and the value of costs or benefits in the appraisal. These changes are published as annual updates to the TAG *"Data Book"* (a central source of values for time, vehicle operating costs, accident costs etc. for use in modelling and appraisal). These various values are generally 'frozen' at the time a transport model is developed and validated but (as was the case with the M4 Smart Motorway model) the implications from updates are assessed using sensitivity analysis.

4.7 The update to the capacity of the road network to reflect the December 2014 Road Investment Strategy has no direct implication for the M4 Smart Motorway model. However, any schemes announced in the Investment Strategy that had not previously featured in the roads programme would not have been included in the M4 Smart Motorway model.

4.8 To summarise, those effect of changes to those factors which directly feed into the metrics used for the M4 Smart Motorway model (e.g. fuel costs) have been considered. Changes that reflect uncertainty over underlying relationships such as between income and car use, will feed into future changes to NTEM and, as such, have not been considered within the M4 Smart Motorway model forecasts.

4.9 Highways England confirmed that it validated its model against 2009 data and used the then horizons for the trip end model. Since then the Department for Transport has kept the economic position under review and (in light of the recession) adjusted the value of time downwards. The model, therefore, took account of the recession. The model was subject to a validation check in 2013 by applying growth factors to the 2009 model and checking those forecasts against observed data for 2013 to make sure that the model was still valid for use.

5. Have the concerns in relation to the DfT Road Traffic Forecasts 2013, cited in the 2015 version, been taken into account in the HE M4 Smart Motorway Traffic Forecasting methodology?

Highways England Response

5.1 The concerns in relation to the DfT Road Traffic Forecasts 2013 are summarised in paragraph 5 of the Executive Summary to the 2015 version as follows: *"This new set of forecasts is an update to Road Traffic Forecasts 2013 (RTF13). Some stakeholders have expressed a general concern around how our forecasts of significant traffic growth fit with recent data showing a largely flat trend over the last decade, and highlighted specific issues such as the performance of the forecast in London."*

5.2 The general concern over the apparent conflict between the DfT forecasts of significant growth and a largely flat trend over the last decade has been addressed within the 2015 forecasts through the introduction of additional forecast scenarios in which the underlying assumptions that have historically underpinned earlier sets of forecasts are replaced with other potential explanatory variables. However, as the 2015 forecasts were published after completion of the M4 Smart Motorway model, these additional forecasts have not been taken into account.

5.3 As stated in paragraph 2.29 of Road Traffic Forecasts 2015, *"A full update of NTEM is underway and is scheduled to complete early in 2016."* In the meantime, the DfT has stated that scheme promoters should continue to use the current (version 6.2) of NTEM until the update is ready for use.

5.4 Highways England confirmed that, in order to carry out the analysis in the same way, it would not be able to update its model until the more recent NTEM was provided. Highways England could, however, look at the implications of an alternative growth scenario by means of a sensitivity test.

6. Re Section 3.1 of the HE Traffic Forecasting Report, the starting point for the development of the forecast year highway networks was the 2009 base year highway network as described in the Local Model Validation Report. To what extent is 2009 a valid base year, given that it is already 6 years ago and much has changed in the interim?

Highways England Response

6.1 Partly in anticipation of this question and also in response to the withdrawal by Defra of the 2009-based emission factors used for air quality modelling, a validation check of the model against M4 traffic flows was undertaken in 2014. Data was obtained from Highways England's Traffic Data System, TRADS, for 2013 and compared to a model forecast for the

same year. The review found that flows had increased by an average of 2% between the two years and that the percentage difference between observed and modelled flows had remained constant and therefore within the previously validated range. Accordingly, the 2009-based model was considered to remain acceptable for the purposes of forecasting.

6.2 Highways England confirmed that there had been no observed data since 2013 but that the 2014 model was cross-checked against the 2013 data (and had to operate within a 5% range of tolerance for validation purposes).

7. Re Section 1.4 of the HE Traffic Forecasting Report, the model appears to have evolved substantially over the period of the M4 Smart Motorway development. What is the nature and significance of the changes, and how much confidence should we therefore have in the current modelling?

Highways England Response

7.1 Highways England confirmed that the model has evolved over the years and continues to do so. The principal development during this period was the release in August 2012 of TAG Unit 3.19 (now Unit M3.1) – Highway Assignment Modelling. Prior to the release of this Unit, any shortcomings in the initial trip matrices (trips between origins and destinations collated in the form of a matrix) based on observed data could be manipulated to provide a better fit between modelled and observed values when assigned to the model highway network – a process called matrix estimation. The TAG Unit required greater emphasis be placed on improving the quality of the initial matrices (by obtaining more observed data) and reducing the reliance on matrix estimation to achieve model validation.

7.2 It was recognised that the earlier generation of M4 Smart Motorway model did not meet the best practice demanded by Unit M3.1 and consequently, as noted in section 1.4 of the Traffic Forecasting Report, newly available origin-destination data was obtained from Trafficmaster to replace older, less reliable data. These data added to the programme of traffic data collection comprising origin-destination, traffic count and journey time surveys undertaken in 2009-10 to build the model. Following the obtaining of the additional data, the model was updated and revalidated.

7.3 In summary, the changes described in section 1.4 of the Traffic Forecasting Report have resulted in an improvement to the quality of the resulting model.

7.4 Highways England confirmed, in response to questioning from the Examining Authority, that the additional data was obtained between 2009 and 2010 and that the TAG was published in

August 2012. It was decided to update the validation from a common year and 2009/2010 was chosen. This provided for a more rigorous validation process.

8. Has the HE M4 Smart Motorway Traffic Forecast been independently assessed and verified?

Highways England Response

8.1 In line with standard practice, the model validation and subsequent forecasts for the M4 Smart Motorway model have been assessed and signed off by Highways England's Traffic Appraisal, Modelling and Economics (TAME) Appraisal Certifying Officer. In addition following completion of the appraisal an independent assessment is carried out of the traffic forecasting outputs by the DfT transport appraisal and strategic modelling team.

8.2 Highways England, in response to questioning from the Examining Authority, confirmed that the first assessment is carried out by Highways England and the second assessment is carried out by the Department for Transport. The TAME officer is rigorous in its level of scrutiny of the traffic forecast as public money is being spent. In addition, the scrutiny provided by the DCO process itself (involving consultation and examination) ensures that there is no doubt cast over the independence of the assessment and verification process. Furthermore, TfL and the GLA have both expressed their satisfaction with the approach adopted by Highways England.

9. Re Section 2.49 of the DfT Road Traffic Forecasts 2015 report, which states that efficiency improvements are forecast to result in a 40% improvement in the average fuel consumption of the car fleet, a 34% improvement for light goods vehicles (LGVs) and a 14% improvement for heavy goods vehicles (HGVs), since a lot depends on these forecasts in terms of emissions and public health, how solid and reliable are they, on what assumptions do they rely, and have these metrics been used in the HE M4 Smart Motorway modelling?

9.1 The forecast fuel efficiency savings form a component of fuel costs which, in turn, feed into transport models and appraisals. TAG Unit A1.3, User and Provider Impacts explains in paragraph 5.1.5:

9.1.1 "The parameters for these equations (i.e. those that relate to underlying calculations) were derived to be consistent with the latest fleet composition and projections and methods used in the National Atmospheric Emissions Inventory (NAEI), which can be found at: http://naei.defra.gov.uk"

9.2 The referenced source for the methods is given as: 'Ricardo-AEA unpublished report *"Production of Updated Emission Curves for Use in the National Transport Model"* dated 24 February 2014'.

9.3 The projections for these variables, as they applied at the time, were inbuilt to the vehicle operating cost values input to the M4 Smart Motorway model.

9.4 However, these metrics have not been used in the air quality assessment for this Scheme. The air quality assessment has been based on Defra published emission rates and Defra tools, combined with post processing following Highways England's Interim Advice Note (IAN) 170/12 v3 ('Updated air quality advice on the assessment of future NO_x and NO_2 projections for users of DMRB Volume 11, Section 3, Part 1 'Air Quality').

9.5 Highways England summarised that the above represents the national view, obtained by applying vehicle emissions and technological benefits to the fleet. That underlying national theory and costs analysis is then applied to the Scheme specific model. The Department for Transport data is recognised and then used to develop a bespoke model. However, no approved national emissions data sets have been released since recent revelations about the actual performance of certain parts of the fleet. As such, Highways England's air quality modelling is unable to reflect them.

10. Re Table 3.3 of the DfT Road Traffic Forecasts 2015 report, which states that traffic growth on the Strategic Road Network is forecast to increase by 29-60% by 2040, and congestion is forecast to increase by 13-20% by 2040 (with the weekday peak up by 14-35%), does the applicant recognise these figures, since the M4 Smart Motorway appears to forecast lower figures throughout?

Highways England Response

10.1 The applicant recognises these figures from the quoted source. Taking the Strategic Road Network, for which traffic is forecast to increase by 29-60% by 2040, the quoted range reflects the outcome forecast for each of the 5 scenarios that form the range of possible outcomes. Each figure within the range will itself be an average of the forecast growth for the total Strategic Road Network across Great Britain under the respective sets of assumptions that form each Scenario.

10.2 The forecasts for the M4 Smart Motorway, up to 24% by 2037, are for a single route within the Strategic Road Network and derived from a bespoke local model based on assumptions consistent with those used within the National Transport Model.

11. Re Sections 3.54-3.63 of the DfT Road Traffic Forecasts 2015 report, which records DfT's forecasts for emissions, and in particular Section 3.59 which states that CO_2 is forecast to fall by between 3% and 26% from 2010 to 2040, are these figures recognised in the M4 Smart Motorway modelling?

Highways England Response

11.1 It is believed these figures are derived from the assumptions input to the National Transport Model on fuel efficiency and traffic growth and the subsequent estimation of the effects on emissions through separate emissions modelling.

11.2 The effects of the M4 Smart Motorway on CO_2 levels has been separately modelled and assessed. However, as stated in the response to paragraph 9 above, these metrics have not been used in the air quality assessment for the Scheme. The carbon calculations have been completed using the emissions factor toolkit, which projects future emissions as far forward as 2030. The carbon emissions assessment therefore assumes no reduction in carbon emissions beyond 2030.

11.3 Highways England summarised that the Department for Transport figures are not directly included but are reflected in the M4 traffic model which is bespoke to the Scheme. Highways England has provided a summary to clarify how the national assumptions feed through to the local model in Appendix B.

12. Re Section 3.61 of the DfT Road Traffic Forecasts 2015 report, this states in the forecast for NO_x emissions that these will decline by 65% to 73% between 2010 and 2040 largely due to the assumption of declining emissions per vehicle mile expected to be achieved through European vehicle standards. There is a critical dependency on the implementation of European vehicle standards to achieve this decline. Are these figures assumed in the M4 Smart Motorway modelling? In view of current uncertainty as to the achievement of the standards, how realistic is this assumption?

Highways England Response

12.1 These figures are derived from the assumptions input to the National Transport Model on fuel efficiency and traffic growth and the subsequent estimation of the effects on emissions through separate emissions modelling.

12.2 The effects of the M4 Smart Motorway on NO_x levels has been separately modelled and assessed. However, as stated in the response to paragraph 9 above, these metrics have not been used in the air quality assessment for this Scheme. The assessment has been based on Defra published emission rates and tools, combined with post processing following Highways England's Interim Advice Note (IAN) 170/12 v3 ('Updated air quality advice on the assessment of future NO_x and NO_2 projections for users of DMRB Volume 11, Section 3, Part 1 'Air Quality').

12.3 Highways England explained that the national approach of the Department for Transport is to receive industry guidance on emissions, which translates into assumptions on petrol cost per mile. These assumptions on vehicle cost are fed into the Scheme transport model. At this

point the environmental analysis is affected, using data from the transport model. The outcome of emissions arises from this environmental analysis stage, rather than the initial traffic modelling stage.

13. *Re Section 3.61 of the DfT Road Traffic Forecasts 2015 report, which states that PM_{10} emissions are forecast to reduce by 92% to 94% between 2010 and 2040, again on the assumption of improvements in vehicle PM_{10} emissions through European vehicle standards, are these figures recognised in the M4 Smart Motorway modelling and how realistic is this assumption?*

Highways England Response

13.1 These figures are derived from the assumptions input to the National Transport Model on fuel efficiency and traffic growth and the subsequent estimation of the effects on emissions through separate emissions modelling.

13.2 The effects of the M4 Smart Motorway on PM_{10} levels has been separately modelled and assessed. However, as stated in the response to paragraph 9 above, these metrics have not been used in the air quality assessment for this Scheme. The assessment has been based on Defra published emission rates and tools PM_{10} is not envisaged to be a key pollutant for the Scheme. This is more of a concern in city centre locations. All of the AQMA's along the Scheme are designated for NO_2 only.

14. *Re Section 4.4 of the HE Traffic Forecasting Report, which discusses the treatment of uncertainty in forecasting, how were the uncertainties addressed, and what confidence level do the applicant and other IPs have in this process?*

Highways England Response

14.1 As described in the subsequent paragraphs in section 4.4 of the Traffic Forecasting Report, uncertainty is addressed at two levels – national and local.

14.2 Uncertainty at the national level reflects those factors considered within the Road Traffic Forecasts, including GDP growth, fuel prices and efficiencies. Rather than predict each of these explicitly, TAG advises the use of an appropriate range about the core scenario NTEM growth forecast of ±2.5% for traffic forecasts one year ahead of the model base year, rising with the square root of the number of years to ±15% for forecasts 36 years ahead. This approach was applied within the M4 Smart Model forecasts to derive alternative high and low scenarios either side of a core scenario. These alternative scenarios are reported in Appendices B and C respectively in the Traffic Forecasting Report.

14.3 To summarise; that is the national level of uncertainty, reflecting the effects of changes in the economy.

14.4 Local uncertainty reflects the uncertainty over whether planned developments, local highway or public transport schemes will be implemented within the forecast period for the M4 Smart Motorway model. There is a standardised approach to grading the level of uncertainty set out in TAG Unit M4, Forecasting and Uncertainty. Developments that have consent but are yet to be implemented are 'near certain' for implementation. Developments that are aspirational, have yet to seek consent and/or do not have any formal planning status can be considered as 'hypothetical'. The former would be included in a core scenario, the latter would not feature in a core scenario but could be included in a 'high' scenario.

14.5 The level of confidence that can be ascribed to the process depends on the quality of information obtained concerning the future plans from the respective authorities. Each of the local planning authorities was contacted to obtain relevant details of plans and applications. This was supplemented or substituted as necessary with searches of the various planning websites to collate the required information into a database, known as an 'Uncertainty Log'.

14.6 In summary, the approach to uncertainty followed in the preparation of the forecasts for the M4 Smart Motorway model followed the guidance set out in TAG Unit M4.

14.7 Highways England confirmed that it would clarify which developments (for example, HS2, HEX and SIFE) were included in the uncertainty log in its response at Deadline V.

14.8 Details of all the developments considered within the traffic model are provided in the Deadline IV submission at the response to point 2.1 in Appendix B - Environmental Hearing, Preliminary Matters. HS2 and HEX were not included in the cumulative assessment for the operational stage of the M4 smart motorway on the basis that both are public transport schemes and that neither will attract patronage from passengers in the Thames Valley corridor. As explained in the response to question 3 above, SIFE was also not included in the cumulative assessment as at the time the M4 model forecasts were prepared, consent for the development had been refused.

15. Re Section 6.1 of the HE Traffic Forecasting Report, which discusses the realism tests that have been undertaken to demonstrate that the modelled demand responses are plausible, both in the direction and scale of change, were these realism tests done independently of the modelling contractor?

Highways England Response

15.1 The realism tests are an essential step in ensuring that the transport model will respond correctly to changes in key variables, particularly those influencing travel costs. Guidance on undertaking realism tests is provided in TAG Unit M2. The realism tests were undertaken by the modelling contractor in line with the guidance and the results presented to the Highways England Appraisal Certifying Officer for approval before proceeding to the next stage. Highways England confirmed that the certifying officer scrutinises the work of those creating the traffic forecasting report to a significant degree.

16. Re Section 7.2 of the HE Traffic Forecasting Report, which considers the key highway impacts of the Core Scenario, and states that the overall levels of induced trips relative to the Do-Minimum scenario are less than 0.3% in all time periods in both forecast years, to what does this refer (it seems very low compared with other traffic forecasts in the HE and DfT Road Traffic Forecasting Reports)?

Highways England Response

16.1 The levels of induced traffic are presented by modelled time period in Tables A-5, B-5 and C-5 of the Traffic Forecasting Report for the core, high and low growth scenarios respectively. The term induced traffic, often referred to as generated traffic, refers to trips that prior to the implementation of the M4 Smart Motorway were either not made or used an alternative mode to road. Following completion of the Smart Motorway, additional traffic is forecast to travel on the M4. From a comparison of the size of the highway trip without the M4 Smart Motorway scheme with that with the Scheme and after the variable demand model has been run, provides an indication of the level of traffic 'induced' by the Scheme to make use of the additional capacity.

16.2 Reference should also be made to Tables A-31 and 32, B-31 and 32 and C-31 and 32 in the Traffic Forecasting Report. These show the modal share statistics without and again with the M4 Smart Motorway scheme and after running the variable demand model. The minimal changes in public transport mode share suggest that the induced traffic total is not obtained by abstracting trips from public transport and therefore the additional trips using the M4 mainly comprise redistributed and re-assigned trips.

16.3 It is Highways England's contention that whilst acknowledged as a low level of induced traffic, it is a fair reflection of the existing generally congested conditions both on the M4 and on the surrounding road network, together with the balanced transport strategy in the Thames Valley with enhancements to public transport provision alongside the additional highway capacity.

17. Re Section 7.4 of the HE Traffic Forecasting Report, which summarises the report's conclusions, how does the traffic growth of 24% stated for the Core Growth Scenario relate to the traffic growth range of 29-60% stated for the Strategic Road Network in Clause 15 of the Executive Summary of DfT's Road Traffic Forecasting Report 2015?

Highways England Response

17.1 The relationship between the 24% growth stated for the Core Growth Scenario to the traffic growth range of 29-60% for the Strategic Road Network is explained in the response to 'Section B – Traffic Forecasting' Question 10. The figure of 24% relates to the growth obtained by the application of NTEM growth within the M4 Smart Motorway model; the Road Traffic Forecast figures reflect the range of outcomes from a set of possible scenarios with differing underlying assumptions.

17.2 Highways England confirmed that, out of the possible scenarios, the nearest appropriate one was scenario one. This was a reflection on the local economy being at the upper end in terms of economic growth and the actual level of congestion in the area (influenced by the ability and willingness of drivers to use the local road network), which limits additional traffic coming onto the road.

18. Re Section 7.4 of the HE Traffic Forecasting Report, how does the applicant explain the fact that the traffic growth figures for the design year of 2037 are stated to be the same for the High Growth Scenario as for the Core Growth scenario, and only slightly different (in one traffic direction only) for the Low Growth scenario?

Highways England Response

18.1 The figures quoted in Section 7.4 for the 2037 design year are based on the link with the highest flow – between junctions 10 and 11. From reference to Tables A-22 and 23, B-22 and 23, and C-22 and 23 in the Traffic Forecasting Report it can be seen that this section of the M4 reaches volume to capacity ratios of 97.7%, 98.0% and 96.8% in each of the core, high and low growth scenarios respectively. Even under a scenario of low growth that section is edging toward capacity. Under all three of the scenarios, the ratio is very close to 100%. All three appear similar as they carry very similar volumes of traffic. This indicates that this section of the M4 reaches capacity in each of the three scenarios and this is, in effect, capping growth.

18.2 This is just one link and not necessarily reflective of the ability of other sections of the M4 to carry increased traffic.

18.3 From reference to the numbers of trips by time period in Table A-5 and application of the factors in paragraph 6.7.4 of the Traffic Forecasting Report, it can be demonstrated that the

total 12-hour modelled trips increases from a 2009 base year total of 4,004,600 to a 2037 Do Minimum total of 5,286,600 trips – an increase of 32% between the years. Similar calculations for the low and high growth scenarios are 7% below or above the core level respectively. This demonstrates that overall growth does vary by scenario.

19. Re the previous question, what levels of confidence do the applicant and other IPs have that the High Growth and Low Growth scenarios represent realistic high and low bounds?

Highways England Response

19.1 The Core, Low Growth and High Growth scenarios used for the forecasts for the M4 Smart Motorway model were developed in accordance with the principles laid down in Tag Unit M4 and based on factors derived from the current version 6.2 of NTEM. The three scenarios are analogous in their assumptions to Scenarios 1, 4 and 5 in Road Traffic Forecasts 2015. It is acknowledged that the assumptions used to derive Scenario 3 in Road Traffic Forecasts would, in all likelihood, produce a lower Low Growth bound if applied within the M4 Smart Motorway model. However, a version of NTEM incorporating these assumptions is not expected to be available until 2016.

19.2 Highways England reiterated that scenarios engineered have to rely upon projections and the application of previously published data sets. The latest version of the NTEM was used in the construction of the scenarios. The fact that another version is due in 2016 has no bearing on what can be modelled for the Scheme at the present time.

20. Re Section 7.4 of the HE Traffic Forecasting Report, what level of confidence do the applicant and other interested parties have in the forecast 1% increase in flow on the M25 (J10-17)?

Highways England Response

20.1 The section of the M25 between junctions 10 and 17 is operating at or near capacity and this is reflected in the M4 Smart Motorway model. Accordingly, the assigned flows and consequent impacts on journey times (both increasing by the order of 1%) reflect the lack of additional capacity. Examination of the model assignments does suggest this apparent lack of change is masking an underlying redistribution of trips between the M40, M3 and M4 corridors.

21. Re Section 7.4 of the HE Traffic Forecasting Report, what is the view of interested parties, in particular local authorities, on the stated distributional effects (i.e. no more than an additional 1200 trips per hour (c 0.2%) in any time period across the whole matrix)?

Highways England Response

21.1 The final paragraph of Section 7.4 of the Traffic Forecasting Report states: "The Scheme would generate no more than an additional 1200 trips per hour (c 0.2%) in any time period across the whole matrix. However, it would have significant distributional effects, with inter-sector movements between the wider M4 corridor west of Newbury and the Slough, Staines, Heathrow area, for example, increasing by between 7% and 10% in the morning and evening peak periods in 2022 and 2037 and under all three growth scenarios."

21.2 The figure of 1200 trips per hour relates to the amount of traffic induced, taken from Table A-5 of the Traffic Forecasting Report. The remainder of the paragraph summarises the effects on trip distribution (i.e. changes in the destination of trips), which is a separate issue to the level of induced trips. The distributional effects are described in Figures A-3 to A-4 and Tables A-6 to A-13 inclusive. The highest distributional effects in percentage terms occur in the morning peak periods and if the most significant movements presented in the Tables and described in paragraph 7.4 are totalled, they represent some 850 trips in any one hour, spread across all the sector-to-sector movements.

22. How would the applicant demonstrate that the study area used for traffic forecasting ensures that an accurate assessment is provided of changes to traffic flows in terms of the wider road network?

Highways England Response

22.1 The M4 Smart Motorway model has been developed in accordance with the principles laid down in TAG and has been validated in accordance with the criteria set out in the Design Manual for Roads and Bridges (Volume 12, Section 2, Part 1, Chapter 4, Table 4.2 Assignment Validation Acceptability Guidelines,). The travel demand validation has been demonstrated through 'goodness of fit' against prescribed parameters and the assignment validation has been demonstrated in terms of meeting the required level of tolerance between observed and modelled values across a range of cordons and screenline totals and journey times. It is to be noted that the model is designed to be suitable for the appraisal of a major scheme at a strategic level and, as such, cannot be expected to exactly replicate traffic flows on every individual link across the wider road network.

22.2 Highways England, at the request of the Examining Authority, explained that the model is validated on only a section of local roads as it is based on screen lines taken across a study area. This involves running theoretical lines over an area and then looking at the traffic movements across that line. The result is that only a number of local/very local roads are incorporated. There is an attempt to capture those key routes across the network; that is, those most likely to be affected. The results that are found on key routes are, usually, reflective of

the results that would be found on the lesser "non-key" routes within the area (that is, those too small to be considered). The view being taken is that the amount of traffic lost is not significant.

23. *What is the applicant's response to Buckinghamshire County Council's (Bucks CC) assertion in its written representation at Deadline II REP2-039 that the ES submitted in support of the draft Development Consent Order (dDCO) does not adequately assess the impact of the proposed smart motorway scheme on the local road network during construction or operations and that no mitigation measures have been proposed?*

Highways England Response

23.1 Highways England has met with Bucks CC officers subsequent to Deadline II (on the 11th November) and has undertaken to continue to work with the officers to provide the County Council with additional information on the assessment of the local road network during the operation and construction of the Scheme and to reach agreement on what, if any, mitigation would be appropriate.

C. AIR QUALITY

1. *Has any agreement been reached with LB Hill and S Bucks DC on the study area for the assessment of construction effects and for the assessment of operational effects? Are there any other IPs who raise any issue as to the definition of the study area?*

Highways England Response

1.1 With the London Borough of Hillingdon it was indicated in the Issue Specific Hearing that this would be concluded in written submissions from the London Borough of Hillingdon to follow at Deadline IV.

1.2 A Statement of Common Ground has been agreed with South Bucks, and no aspects of the assessment, including the study area, are "not agreed".

2. *Do the local planning authorities (LPA) have any comments on the monitoring data in their air quality management areas (AQMA) and identify any areas of particular concern?*

Highways England Response

2.1 The Local Authorities did not raise issues concerning monitoring data aside from the London Borough of Hillingdon with respect to the AURN site, as discussed below.

3. *Do the LPAs have any comments on the prediction of emissions in their AQMAs including for NO_2 and PM_{10}?*

Highways England Response

3.1 The Local Authorities provided an overview of AQMAs and possible Scheme effects. The Examining Panel requested a summary note from the relevant Local Authorities in this matter. Highways England will respond to that note at Deadline V.

4. Para 5.11 of the National Policy Statement for National Networks (NPSNN) addresses effects on existing AQMAs and conditions where new AQMAs may be required. To what extent would the M4 scheme prevent the achievement of compliance with air quality objectives in the AQMAs affected by the scheme or require new AQMAs or change the size of existing AQMAs?

Highways England Response

4.1 The following air quality management areas are located along the proposed Scheme and surrounding affected road network.

4.1.1 Reading AQMA (Reading Borough Council);

4.1.2 Bray/M4 AQMA (Royal Borough of Windsor and Maidenhead);

4.1.3 South Bucks AQMA (South Bucks District Council);

4.1.4 Slough AQMA No. 1 (Slough Borough Council);

4.1.5 Wokingham AQMA (Wokingham District Council);

4.1.6 Hillingdon AQMA (London Borough of Hillingdon);

4.1.7 Hounslow AQMA (London Borough of Hounslow);

4.1.8 Wycombe AQMA (Wycombe District Council); and

4.1.9 Surrey Heath AQMA (Surrey Heath District Council).

4.2 Within these AQMAs, the predicted effect of the Scheme would not require a change to the shape of these AQMAs, nor would it result in any new AQMAs needing to be declared. This is the policy test for where air quality considerations are likely to be particularly relevant (paragraph 5.11, bullet point 2 of the NN NPS).

5. Can local authorities and IPs who do not agree the study area identify the additional areas which they consider should be included within the study area, and with their reasons for so doing?

Highways England Response

5.1 Please see response to question 1.

6. The monitoring data from the Automatic Urban and Rural Network (AURN) site in Hillingdon is not included in ES Tables 6.12 and 6.13. However data from the co–located diffusion tube has been included. Can the applicant explain this omission and how the inclusion from this monitor might have affected the modelling?

Highways England Response

6.1 The data from the continuous monitoring site was not used for the ES because a robust verification had already been achieved in the Preliminary Environmental Information Report (issued November 2014). Calculations have been undertaken to establish how the verification of the air quality modelling, and therefore the pollutant concentrations that would have been predicted, would be different had this data been utilised.

6.2 In these calculations the measured concentration of oxides of nitrogen ("NO_x") from the continuous monitoring station was included in the *"Rest of Study Area"* zone verification calculation in place of the co-located HD31 diffusion tubes. This zone includes 68 measurement locations.

6.3 This approach is consistent with the methodology for verification set out in Defra's Technical Guidance TG(09) in paragraph A3.240:

"For the verification and adjustment of NO_X/NO_2 a combination of continuous monitoring and diffusion tubes is recommended. As described above, some types of sites can perform differently, and it is considered better to have multiple sites at which to verify results rather than just one continuous monitor. The use of one continuous monitor alone to derive the adjustment factor for a model is not recommended as the monitoring site may not be representative of other locations modelled, and the adjustment factor derived will be heavily dependent on the source to receptor relationship as represented by the meteorological data file used in the dispersion model."

6.4 The calculations indicate that the verification factor would increase due to the higher monitored concentration at the continuous monitor compared to the quoted diffusion tube with a lower concentration. The increase in verification factor would change the oxides of nitrogen correction factor for the *"Rest of the Study Area"* zone as reported in Appendix 6.4 of the ES by 0.01 increasing the factor from 1.64 to 1.65.

6.5 Highways England considers this change to be far too small to result in a significant difference in predicted concentrations. Therefore, the assessment of effects of the proposed Scheme on air quality would not be altered and a significant effect on air quality would not be predicted.

7. Can the applicant clarify why data sets from 2009 to 2013 have been used (ES Table 6.4.3 in Appendix 6.4). How could this have affected the results of the modelling?

Highways England Response

7.1 Data has been used between 2009 and 2013. This is because some monitoring points were only in situ in 2009/2010 e.g. tubes with the reference MO.

7.2 Data between these periods has been used to increase the number of data points that were available to check how well our air quality model was performing.

7.3 In total our model performance has been checked against 167 monitoring points. This has allowed us to identify locations were a specific verification factor was required to best match monitoring.

7.4 Monitoring trends in the Scheme study area have shown no clear trend in measured concentrations over time (2009-2013). The use of measurement data collected over this period is therefore considered to be representative of pollutant concentrations in the study area and should not have adversely affected modelling outcomes, but rather improved modelling outcomes and increased confidence in the model.

7.5 Highways England clarified, at the instigation of the Examining Authority, what the effect would be if the AURN data for the past 15 years was included (see response to question 6 above). The traffic modelling has 2013 as its baseline year, therefore measurement data for 2013 is used where available . Data would only be used from an alternative year where Highways England did not already have data for 2013.

8. In ES para 6.2.79 reference is made to an unpublished research project by Laxen and Marner (ref 6-12). Can the applicant provide this research?

Highways England Response

8.1 Highways England confirmed that this was the result of an administrative error; the research project is published and will be provided to the Examining Authority by Duncan Laxen.

9. In the methodology adopted for the air quality assessment, does HE use the Long Term Trends (LTT) methodology in Interim Advice Note IAN 170/12 v3, or the alternative "interim" version of the LTT method, which is more pessimistic about the progress made on reducing vehicular emissions?

Highways England Response

9.1 The modelling undertaken for this assessment uses Defra's published vehicle emission factors, background maps and associated tools. The Scheme assessment applies Highways

England IAN 170/12 v3 ('Updated air quality advice on the assessment of future NO_x and NO_2 projections for users of DMRB Volume 11, Section 3, Part 1 'Air Quality') and long term trends ("LTT_{E6}") spreadsheet version 1.1, which is the updated interim LTT curve issued for use in highways air quality assessments for Highways England schemes in 2014. Highways England confirmed that the long term trends ("LTT") curve would be more pessimistic than LTTs. However, the LTT (version 1) has been withdrawn from use on Highways England schemes as it does not consider reductions in emissions over time and could not account for any Euro VI improvements (due to a lack of advanced Euro VI technology on the road at the time the LTT curve was established).

9.2 In developing the projection factors for IAN 170/12 v3 (LTT_{E6}), Highways England took into account long term measured trends of NO_x and NO_2 (LTT) as well as the emission projections from Defra's emission factor toolkit ("EFT"), based on only improvements in emissions attributed to Euro 6/VI vehicles and their penetration into the UK fleet up to 2030 (E6 Only).

9.3 The measured NO_x and NO_2 trends were based on monitoring data collected before the introduction of Euro 6/VI vehicles on to the UK road network, and consequently the monitoring data doesn't record the impact of Euro 6/VI emissions. Recent emission testing for Euro 6/VI vehicles indicates that whilst measured emissions may be higher, they are lower than Euro 4/IV and Euro 5/V emission measurements. Consequently this is likely to lead to reduction in emissions over time as more Euro 6/VI vehicles enter the national fleet.

9.4 Highways England has adopted a precautionary approach where future changes in NO_2 concentrations would lie between the pessimistic (LTT) and optimistic future projections (E6 Only). It is difficult to estimate precisely where the balance lies in defining the trend line LTT_{E6}, especially on a timescale where the end point is as far away as 2030. Assuming a balance between the two extremes is a prudent way of describing a reasoned NO_x and NO_2 trend line up to 2030 that could be applied to scheme assessments. Highways England keeps this information under review as new evidence emerges on measured vehicle emissions, including Euro 6/VI vehicles.

9.5 Highways England confirmed that the European Commission has announced there was to be an additional backstop conformity test added to the EuroVI provisions. Euro VI will continue to have a mandatory laboratory level but there will be an additional roadside test imposed once the vehicles are on the road to act as a backstop to make sure their performance is of an acceptable standard. There is therefore no proposed relaxation of the Euro VI standards.

9.6 In addition to the above approach to the consideration of uncertainty in future air quality, model verification allows existing uncertainties to be considered. In this verification process, model performance is checked against monitoring data. Appropriate adjustment factors are derived from this process and these are then applied to baseline and future predictions of pollutant concentrations in the ES assessment. This verification process will include consideration of the gap between laboratory vehicle emission performance and real world driving.

10. Having regard to the recently reported failures of vehicles to meet European test standards on emissions, what impact does this have on the assumptions used and assessments provided in the ES, in particular with regard to the numbers and types of vehicles assumed to be Euro 6/VI compliant by 2022?

Highways England Response

10.1 Highways England is aware that over recent years, the rates of improvement anticipated by the Department for Environment, Food and Rural Affairs ("Defra") have not been realised as quickly as anticipated. This is due to the dieselisation of the vehicle fleet to a greater extent than previously anticipated, with the associated higher emissions of NO_x and NO_2, and also because of the gap between the anticipated laboratory based rates of NO_x emissions compared with real world rates of NO_x emissions.

10.2 Similarly, Highways England recognises that not all the improvements in Euro VI emissions in the future may be realised at the same rate as Defra projections.

10.3 The approach utilised in the assessment of future air quality for the Scheme recognises this. Highways England has not assumed that in the future all improvements in air quality (i.e. rates of improvement in vehicle emissions etc.) will occur at the rate anticipated by Defra. In particular, the treatment of future air quality has been considered through the updated air quality advice on the assessment of future NO_x and NO_2 projections known as long term trend ("LTT") analysis (Interim Advice Note ("IAN") 170/12 v3. 'Updated air quality advice on the assessment of future NO_x and NO_2 projections for users of DMRB Volume 11, Section 3, Part 1 'Air Quality''), which assumes only a portion of improvements in air quality anticipated by Defra will occur. This is described in paragraphs 6.2.57 to 6.2.60 of the ES.

10.4 In this approach, all modelling is undertaken consistent with Defra emission rates and associated local air quality management tools. The LTT rates of improvement are applied to post-processed Defra based predictions to provide a more conservative set of results.

10.5 In addition, any gap in laboratory testing cycles used to determine vehicle emissions and real world driving cycles will be captured through the air quality modelling verification procedures. This approach captures the gap between laboratory performance and real world emissions across a range of Euro standards.

10.6 The recent news reports about Volkswagen *"cheat"* devices specifically relate to Euro V standard diesel engines produced between 2009 and 2015.

10.7 In the model verification approach, air quality modelling predictions for a baseline year are compared to air quality monitoring results. In this approach, variances in the pollutant concentration between those predicted by modelling and those actually monitored can be identified and corrected. This verification approach will correct for the gap between laboratory and real world driving conditions along with other aspects of the modelling approach.

11. How realistic are the assumptions of emissions factors used in the assessment of air quality impacts in the ES in the light of recent disclosures? What result would be gained through a reassessment using different trends in vehicular emission improvements to provide worse case scenarios?

Highways England Response

11.1 The assessment of the effects on air quality include steps that account for uncertainty in emissions from vehicles. Please see response to 'Section C – Air Quality' Question 10 above.

11.2 Reasons why the long-term trend (LTT) based on recent years monitoring data is considered to be too conservative for an opening year of 2022:

11.2.1 Introduction of EURO VI for HDVs and buses, has only been mandatory standard since January 2014.

11.2.2 Euro 6 became mandatory in September 2015 for cars and light vans. It will become mandatory in September 2016 for larger vans.

11.2.3 Increased uptake of ultra-low emission vehicles (2015 year to September, uptake was 261% higher than equivalent 2014 period).

11.2.4 Transition from New European Drive Cycle (NEDC) to the new World Harmonised Light-duty Test Cycle (WLTC) is expected in 2017.

11.2.5 Conformity test – to control divergence between regulatory limit as tested in laboratory conditions vs Real Driving Emissions (RDE):

11.2.5.1 2.1 for new models by 2017 (for new vehicles by 2019); and

11.2.5.2 1.5 (to allow for technical margins of error) by January 2020 for new models (and January 2021 for all new vehicles).

11.2.5.3 Revised Defra National Air Quality Action Plans.

12. Can the applicant explain why concentrations of NO_2 are expected to be lower in 2037 than in 2022? How much confidence can be placed on the anticipation of lower emission rates from vehicles between the opening year and the design year, having regard to recent revelations of incorrect vehicular emission test results?

Highways England Response

12.1 Annual mean concentrations of NO_2 are expected to be lower in 2037 compared to 2022 due to anticipated improvements in vehicle emission rates and background concentrations.

12.2 The long-term trends approach utilised in the opening year assessment has also been applied to the design year predictions, therefore not all anticipated improvements have been realised in the assessment.

12.3 In addition, the tools used in the assessment along with the emission rates, backgrounds and long-term trend calculator only project as far as 2030, whereas the design year is 2037. Therefore additional conservatism is included in the design year predictions as further improvements may be expected in air quality beyond 2030.

12.4 See response to question 11 for reasons reductions in emissions over time are likely.

13. LB Hill has submitted a consultant's review of the HE methodology for calculating the air quality impacts. Has this been discussed with HE, and can the outcome of such discussions be presented at the hearing?

Highways England Response

13.1 The review has not been discussed directly with the London Borough of Hillingdon directly, however a response has been prepared by Highways England to those points identified in the Local Impact Report, which was submitted for Deadline III.

13.2 Within their Local Impact Report, the London Borough of Hillingdon identified which aspects of the air quality assessment they had concerns with, both based on the consultant's

review included within an appendix to the Local Impact Report and concerns they already held.

13.2.1 Methodology for assessment of significance;

13.2.2 Operation of London Hillingdon AURN Monitoring Station;

13.2.3 Baseline – data collected from the London Hillingdon AURN and trends;

13.2.4 Future assessment without Scheme predictions not being presented;

13.2.5 Request for EU Limit Value compliance assessment for the M4;

13.2.6 Concerns that modelling has under-estimated concentrations – request for further details on model input data;

13.2.7 Sensitivity testing for future scenarios; and

13.2.8 Approach to EU Limit Value compliance assessment.

13.3 A short summary of the response to these points provided in response to the Local Impact Report are addressed in turn:

13.3.1 Highways England confirmed the use of the methodologies set out in DMRB and associated IANs (170/12, 174/13 and 175/13) to assess the effects of the Scheme, operational significance and compliance with EU Limit Values;

13.3.2 It has been confirmed that the AURN monitor will be retained during the construction works, and discussions regarding the implications of the works are ongoing with Defra;

13.3.3 Details on trends at the London Borough of Hillingdon monitor and additional local monitoring data has been presented in response to the Local Impact Report. Confirmation that inclusion of the AURN monitor within the air quality assessment would not affect the results was presented;

13.3.4 It was confirmed that these results are presented in Appendix 6.6 of the Environmental Statement;

13.3.5 It was confirmed that the M4 is not a compliance link in Defra's Pollution Climate Modelling (PCM) data and therefore a compliance assessment was not required;

13.3.6 It was outlined that the modelling is based on Defra's assumptions within their emission rates, before the IAN long-term trend adjustment is applied;

13.3.7 The use of long-term trends and model verification to account for discrepancies between laboratory test results and real world emissions; and

13.3.8 Highways England explained their position on EU Limit Value compliance assessment and the appropriateness of the methodology.

13.4 The review also identified points of the methodology and assessment that the consultants agreed with. These include the following aspects/statements:

13.4.1 Following the DMRB and Interim Advice Notes (IAN) methodologies is *"appropriate for a HE Scheme"*;

13.4.2 The use of ADMS-Roads, with emissions from the Emissions Factor Toolkit to model emissions; and

13.4.3 The verification process, including agreement that the *"adjustment factors seem reasonable"*.

13.5 The above text covers those points raised in the LIR and so should be the key focus of any response. In addition to the points identified in the Local Impact Report, the consultants review also identified:

13.5.1 The location of HD31 diffusion tube; and

13.5.2 The use of measurement data from 2009 – 2013.

13.6 A short summary of the response to these points provided in response to the Local Impact Report are addressed in turn:

13.6.1 This IAN was published after the air quality (and noise) assessment works for the ES had been completed.

13.6.2 The verification calculations have been repeated with this diffusion tube at the revised co-ordinates. The verification factor for the *"Rest of the Study Area"* zone with the revised tube location would be unchanged and as reported in Appendix 6.4 of the ES by remained at 1.64.

13.6.3 Please see response to 'Section C – Air Quality' Question 7.

14. Have any other LPAs reviewed the HE methodology and, if so, what are their findings?

14.1 None were identified during the hearing.

15. In ES para 6.4.1 it is stated that the fleet of vehicles in the UK is subject to steady renewal and changes to the air quality effects will change even without the scheme – can the applicant give further clarification on this assumption in the light of current uncertainties in vehicle emissions. Would this change the base line assumptions both for NO_2 and PM_{10}?

Highways England Response

15.1 The model verification process compares modelled outputs against real world monitored NO_2 concentrations. From this, adjustment factors are derived and applied to modelled outputs at all sensitive receptors in all scenarios. This process therefore accounts for variances between laboratory and real word driving conditions across the range of Euro standards, any differences in the composition of the vehicle fleet compared to that in the emission factors and other such variables. In light of this verification process, it is not considered that changes to baseline assumptions are required.

15.2 Highways England confirmed that it would consider a sensitivity analysis on PM_{10} in light of concerns raised by the Examining Authority over the increasing dieselation of the fleet.

15.3 Highways England does not consider that a sensitivity test for PM_{10} would provide useful data. This is because, whilst dieselisation may reduce the rates of improvement in emissions of PM_{10}, the study area for the Scheme does not include locations predicted to be above the objective values. This includes the current baseline situation (2013), where the maximum concentration is predicted to be 29.8 $\mu g/m^3$, compared to an objective value of 40 $\mu g/m^3$. In the future, with the Scheme in place in 2022, the maximum annual mean concentration of PM_{10} within the study area is predicted to be 26.3 $\mu g/m^3$. In locations such as parts of central London, where PM_{10} air quality objectives may be exceeded, rates of improvement in PM_{10} and the potential influence of dieselisation may be more important, but Highways England considers that this would not be the case for the Scheme study area.

16. In ES para 6.2.49 the number of additional HGVs is considered to be below the relevant threshold and therefore the effect on sensitive receptors is not considered significant. In the light of uncertainties in traffic forecasting and emissions, can the applicant give its considered opinion that this conclusion is still valid?

Highways England Response

16.1 This aspect of the assessment is in relation to the construction phase of the assessment. The Engineering and Design Report (EDR) identifies an anticipated average increase in HGVs during the construction phase of 150 vehicles per day. This is approximately 75% of the criteria for potential significant effects (of more than 200 HGVs per day), therefore there can be some uncertainty in that prediction and the number of HGVs per day will still be below that criteria.

16.2 Therefore, the conclusion that construction phase emissions from additional HGV movements will be not significant is still valid. As described above the recent VW Scandal does not affect HGVs.

17. To what extent would the M4 scheme prevent the achievement of compliance with air quality objectives in the AQMAs affected by the scheme?

Highways England Response

17.1 The issue of compliance on Highways England Schemes is with EU Limit Values, rather than the objective values presented in the Air Quality Strategy.

17.2 Compliance with EU Limit values have been considered through the compliance risk assessment undertaken for the Scheme.

17.3 The compliance risk assessment has been undertaken using the methodology set out in the Highways England IAN 175/13 'Updated air quality advice on risk assessment related to compliance with the EU Directive on ambient air quality and on the production of Scheme Air Quality Action Plans for user of DMRB Volume 11, Section 3, Part 1 'Air Quality'.

17.4 The risk assessment showed there was a low risk of the Scheme adversely affecting compliance with EU Limit Values (See paragraphs 6.15.4 to 6.15.7 of the ES).

17.5 There are nine Air Quality Management Areas across the Scheme and affected road network.

17.6 Within these AQMAs, the predicted effect of the Scheme would not require a change to the shape of these AQMAs, nor would it result in any new AQMAs needing to be declared. This

is the policy test for where air quality considerations are likely to be particularly relevant (paragraph 5.11, bullet point 2 of the NN NPS).

18. Para 5.13 of the NPSNN lays out when the SoS should refuse consent due to non-compliance with the air quality Directive. The applicant in para 6.18.7 of the ES states that the scheme is not predicted to result in a significant air quality impact. Can the applicant clarify the use and meaning of the word significant?

Highways England Response

18.1 The "significance" terminology applies to the effect of the Scheme on sensitive receptor locations, and takes account of the air quality objective values. Compliance with the EU Directive (Limit Values) is dealt with in a separate "compliance" assessment. Please also note than in paragraph 5.12 of the NN NPS it does refer to a "significant air quality impact" and as such is consistent with DMRB and associated IAN for the assessment of significance for air quality.

18.2 The determination of significance for the local operational assessment (for public exposure and European or nationally designated ecosystems only) has been identified using the methods set out in Interim Advice Note (IAN) 174/13 'Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 Air Quality (HA207/07)'.

18.3 The significance criteria comprise a series of key questions on which the judgment of significance is made:

18.3.1 Is there a risk that environmental standards will be breached?

18.3.2 Is there a high probability of the effect occurring?

18.3.3 Will there be a large change in environmental conditions?

18.3.4 Will the effect continue for a long time?

18.3.5 Will many people be affected?

18.3.6 Is there a risk that protected sites, areas or features will be affected?

18.3.7 Will it be difficult to avoid, or reduce or repair or compensate for the effect?

18.4 Following the collation of information to address the above questions, an informed professional judgment on the significance of local air quality effects for public exposure and European or nationally designated ecosystems has been established.

18.5 The questions set out above form the basis for determining likely significant local operational air quality effects for sensitive receptors. The question of how many people will be affected will be addressed by reference to the number of receptors predicted to experience small, medium and large changes in air quality. Table 18.1 below (Table 6.4 in the ES) provides a basis for assessment as set out in IAN 174/13. Where numbers of affected receptors are above the upper thresholds listed in Table 18.1 for locations above the air quality objective, this may suggest significant air quality effects are more likely. Where a scheme leads to between 30 and 60 properties experiencing a small change over the air quality objective level, a judgement would need to be made as to whether that was "significant". If a scheme leads to more than 60 properties being so affected, it would suggest it is highly likely to be significant and require mitigation. The Scheme is well below the 30 property level, as can be seen in the table below.

18.6 The overall significance of predicted effects on local air quality is also evaluated in the context of relevant national, regional and local air quality planning policy and the findings of the compliance risk assessment.

18.7 Table 18.1: Guideline for number of properties constituting a significant effect

18.8 **Magnitude of Change in NO_2 or PM_{10} ($\mu g/m^3$)**	18.9 **Number of receptors with:**	
	18.10 **Worsening of air quality objective already above objective or creation of a new exceedance**	18.11 **Improvement of an air quality objective already above objective or the removal of an existing exceedance**
18.12 Large (>4)	18.13 0 (1 to 10)	18.14 Large (>4)
18.15 Medium (>2 to 4)	18.16 7 (10 to 30)	18.17 Medium (>2 to 4)
18.18 Small (>0.4 to 2)	18.19 11 (30 to 60)	18.20 Small (>0.4 to 2)

18.21 Where predicted changes in annual average concentrations are less than 0.4µg/m^3 and/or predicted annual average concentrations are less than the objective value with or without the Scheme, the impact is of negligible significance.

19. Having regard to the opinion of Robert McCracken QC on the issue of assessing significance as submitted by the Campaign for Better Transport REP2-036 and others, would an increase in the level of pollution above the EU limit values be illegal, even if that increase was to affect a small part of a wider zone?

Highways England Response

19.1 Compliance with EU Limit values have been considered through the compliance risk assessment undertaken for the Scheme.

19.2 The compliance risk assessment has been undertaken using the methodology set out in the Highways England IAN 175/13 'Updated air quality advice on risk assessment related to compliance with the EU Directive on ambient air quality and on the production of Scheme Air Quality Action Plans for user of DMRB Volume 11, Section 3, Part 1 'Air Quality'.

19.3 The risk assessment showed there was a low risk of the Scheme adversely affecting compliance with EU Limit Values (See paragraphs 6.15.4 to 6.15.7 of the ES). Even Mr McCracken's opinion notes that a breach of the obligation would only occur if a development would *"significantly increase non-compliance"* - this is not the case in relation to the Scheme.

19.4 Highways England, in response to comments made by Friends of the Earth, clarified its position on the opinion from Robert McCracken QC. The opinion was provided for Clean Air London, rather than any Interested Party in the Scheme; as a result, it is unclear what the instructions were, what questions were asked and what information was provided. In addition, the opinion has not been tested in any court. Highways England has to follow the guidance of the IAN and the NN NPS and has done so. No party has suggested either of those is unlawful and, even if they had, they are not open to examination or determination as part of a DCO Examination. Highways England is satisfied that the Scheme will not lead to a risk of non-compliance.

20. Receptors which are predicted by the applicant to experience a medium magnitude increase in annual mean NO_2 concentrations with predicted concentrations above the objective value with the scheme in place are shown on the following plans:

- *Receptors A65_1, A65a_1, A65c and X612 are shown on Drawing 6.5a and X47 is shown on Drawing 6.5b of APP-192 p11.*
- *Receptor X35 is shown on Drawing 6.10 and X36 and X37 are shown on Drawing 6.10a of APP-194 p11.*

The applicant identifies in answer to FRQ E4.6.7 four receptors predicted to experience a medium magnitude increase in annual mean NO_2 concentrations, with predicted concentrations above the objective value with the Scheme in place. These are A65 – on King Street Lane (B3030) adjacent to M4 overbridge; A65a – on King Street Lane (B3030) adjacent to M4 overbridge; X35 – at Lake-End, adjacent to M4, near junction 7 westbound on slip; X612 – on King Street Lane (B3030) adjacent to M4 overbridge. Can the applicant explain the discrepancy with the drawings in the ES?

Highways England Response

20.1 The receptors discussed in the response to FRQ 4.6.7 and identified here (A65, A65a, X35 and X612) are those predicted to be above the objective in the design year (2037).

20.2 In contrast, the receptors identified on the Drawings in the Environmental Statement show predicted concentrations with the Scheme in place and predicted change in annual mean NO_2 concentrations in the Scheme opening year (2022).

20.3 It should be noted that the receptors on Drawings 6.5a that are shown to exceed the objective (with a red centre) are A65, A65a, A65b and X612. The medium increase is denoted with a red outer circle at these receptors.

20.4 A65_1 and A65a_1 identified above are not predicted to exceed the air quality objective for NO_2 in 2022 and are not explicitly shown on Drawing 6.5a as they are the first floor receptors on the same co-ordinates as A65 and A65a respectively.

20.5 Additionally, A65c and X37 identified here are not predicted to be above the objective value in 2022, and these are shown on Drawings 6.5a and 6.10a respectively with an orange centre.

21. Is there any agreement with the local authorities that these are the most significantly affected in terms of changes in air quality? S Bucks DC and Bucks CC state in their local impact report REP2-050 that in excess of 50 properties would be impacted directly as a result of the scheme, together with three sensitive businesses, an ostrich farm, animal sanctuary and caravan park. Can the location of these receptors please be identified by means of a map? To what extent do these receptors reflect the findings of the HE assessment?

Highways England Response

21.1 The statement within the South Bucks and Bucks County Council Local Impact Report referenced in this question is paragraph 5.8 of the Local Impact Report and is reproduced here in full:

"In excess of fifty properties will be impacted directly as a results of the works on carriageway or bridges, in addition to a minimum of 3 sensitive businesses in close proximity including an Ostrich Farm, an Animal Sanctuary and a commercial Caravan Park. Properties will also be impacted directly as a result of compounds and haulage/traffic routes."

21.2 It is therefore identified that these concerns are in relation to the construction phase of the Scheme.

21.3 A wide range of air quality mitigation measures for the construction phase, including both demolition and construction, have been identified, as described in Appendix 6.1 of the ES and in Chapter 6 of the Outline Construction Environmental Management Plan (Appendix 4.2A of the ES). These measures are based on Institute of Air Quality Management ("IAQM") guidance. The mitigation measures include standard mitigation measures (Section 6.2 of the Outline Construction Environmental Management Plan) and additional mitigation measures (Section 6.3 of the Outline Construction Environmental Management Plan) where residential properties are close to construction compounds. Section 5.6 of the Outline Construction Environmental Management Plan (Appendix 4.2A of the ES) also includes measures on site construction layout to control dust and PM_{10}, mud, haulage/traffic movements and spoil.

21.4 The above has been discussed and agreed between Highways England and South Bucks District Council when drafting the Statement of Common Ground in paragraphs 3.30 to 3.32.

21.5 As the implementation of additional mitigation measures is already recommended for this location, the precise location of the receptors identified here would not affect the findings of the air quality assessment.

21.6 Highways England understands that Buckingham County Council normally defer to South Bucks district Council on air quality matters related to the Scheme and no matters related to air quality are noted as "not agreed" in the Statement of Common Ground with Buckingham County Council which was signed on 3rd November 2015.

22. Slough Borough Council (SBC) also refers in its LIR REP2-047 to residential receptors likely to be affected in the construction and operational phases. Can SBC identify the locations of receptors most likely to be affected, and identify any differences with the applicant's findings?

No Highways England Response Required

23. In para 6.2.3 of the ES it states that assumptions have been based on the M3 J2 to 4A Smart Motorway scheme regarding construction plant equipment APP-146. Can the applicant give examples of any other experience gained from this project such as any monitoring data for pollutants of concern, and effects of traffic management measures?

Highways England Response

23.1 Measurement data for nitrogen dioxide is currently being collected along the M3 for the Smart Motorway works between Junctions 2 to 4A. Data is being collected at 19 locations, including two co-locations with local authority monitors.

23.2 This survey commenced in June 2015, therefore four months of data is currently available. Data is to be collected until June 2016, providing a full year of data. This data may help provide information on the effects of traffic management and air quality.

24. In ES para 6.2.42 it is stated that during construction traffic management will reduce the speed of traffic and this may result in some temporary improvement of air quality as emissions from these vehicles will be lower for key pollutants – has the applicant considered similar traffic management measures during the operational phase of the project?

Highways England Response

24.1 Highways England policy does not include the use of speed controls as a measure to reduce emissions to air during the operational phase of a Scheme. In addition, as a significant effect on air quality has not been predicted (as set out in paragraphs 6.15.16 and Tables 6.21 and 6.22 of the ES), Highways England do not consider it necessary to apply air quality mitigation measures to the Scheme.

24.2 The traffic control technology associated with the M4 Smart Motorway scheme will provide the ability to apply variable speed limits during periods of high traffic flows. This will have the effect of reducing both speeds and the occurrence of flow breakdown that leads to stop-start conditions with consequential air quality implications.

25. In ES para 6.2.44 the applicant states that no mitigation measures have been included for the operational phase as no significant air quality effects are anticipated – does the applicant still hold this view in the light of uncertainties in current and future vehicle emissions and continuing dialogue with the EU on air quality infractions in the UK?

Highways England Response

25.1 The assessment of the effects on air quality include steps that account for uncertainty in emissions from vehicles.

25.2 Please see response to 'Section C – Air Quality' Question 10 above.

25.3 Highways England therefore holds the view that no significant air quality effects are predicted due to the Scheme.

26. Para 5.14 of the NPSNN states that the SoS should consider whether mitigation measures put forward are acceptable and at para 5.15 gives examples of such measures. The applicant thus far has considered that the air quality impacts of the scheme are not significant and therefore mitigation is not required. Can the applicant give its considered opinion on whether mitigation measures should be included?

Highways England Response

26.1 The full text of paragraph 5.14 is:

> "The Secretary of State should consider whether mitigation measures put forward by the applicant are acceptable. A management plan may help codify mitigation at this stage. The proposed mitigation measures should ensure that the net impact of a project does not delay the point at which a zone will meet compliance timescales."

26.2 The findings of the compliance assessment as part of the air quality assessment for the M4 (as described in the response to 'Section C – Air Quality' Question 19) concludes that the Scheme will not *"delay the point at which a zone will meet compliance timescales"*, therefore no mitigation measures are proposed for the Scheme.

26.3 Highways England have also committed to explore the possibility of a trial using innovative air quality mitigation solutions e.g. planting.

26.4 In response to questions from the Examining Authority, Highways England confirmed that it is currently running a test on the effect of barriers designed to reduce pollution. The test is yet to conclude and results are not likely to be available until late 2016.

27. To what extent are there proven mitigation measures which could be put in place to reduce the impact on sensitive receptors?

Highways England Response

27.1 As identified in question 24 above, the application of speed restrictions to the M4 would have the effect of reducing the adverse air quality impact on sensitive receptors. This reduction in impact would be due to two main aspects:

27.1.1 Emissions of pollutants from vehicles are generally lower on a g/km basis at 50mph than at 70mph; and

27.1.2 Reductions in speeds on long stretches of road can lead to lower traffic flows as motorists choose alternative routes.

27.2 A reduction in the speed limit could reduce the take up of the additional road space, leading to lower traffic flows and, coupled with increased journey times due to lower speeds, would however reduce the economic benefit of the Scheme.

28. Should there be mitigation which is sufficient to reduce impacts on air quality to the level that would be experienced without the scheme at 2022, or should there be an objective to employ

mitigation to reduce pollution below EU limits in order to potentially provide positive benefits from the scheme?

Highways England Response

28.1 Under the approach taken to the air quality assessment, mitigation measures are to be considered where a significant air quality impact is anticipated or where there is a risk that a Scheme would adversely affect compliance with the Ambient Air Quality Directive. For this Scheme, neither situation is predicted, and consequently no mitigation is required.

29. A Health Impact Assessment has been submitted by the applicant at Deadline III1. Table 22 states that a minor negative impact for air quality is expected in the operational phase and that no mitigation is recommended. In the light of uncertainties in traffic forecasting and air quality does the applicant consider that this should be reviewed? Can the LPAs and statutory authorities, in particular Public Health England (PHE), give their considered opinions?

Highways England Response

29.1 The air quality information used within the Health Impact Assessment ("HIA") was taken from the ES Chapter 6 (Air Quality) (paragraphs 6.5.7, 6.6.7, 6.7.7, 6.8.7, 6.9.7, 6.10.7, 6.11.7, 6.12.7, 6.13.7, 6.14.24, and table 6.23) (Application Document Reference 6-1). The impacts of air quality are not considered to be significant and thereby the impacts on health are equally not considered to be significant.

29.2 The assessment of the effects on air quality include steps that account for uncertainty in emissions from vehicles. Please see response to 'Section C – Air Quality' Question 10 above. Highways England therefore holds the view that no significant air quality effects are predicted due to the Scheme.

29.3 The second question is addressed to the LPAs and statutory authorities, in particular Public Health England ("PHE").

30. SBC considers that a continuous NO_x analyser should be installed at an agreed location over a minimum period of 10 years from the date of consent to determine compliance. Has this been further discussed with the applicant and if so, what are the outcomes? What is the view of the other LPAs and statutory authorities?

Highways England Response

30.1 Discussions on potential monitoring have not been held between Highways England and Slough Borough Council, or other LPAs or statutory authorities.

30.2 As part of the National Air Quality Monitoring Network, it is currently envisaged that an automatic monitor will be installed between junction 11 and junction 12 of the M4, which is part of the proposed Scheme.

30.3 Highways England would be happy to work with local authorities if they wish to install air quality monitoring close to the M4 and to see how Highways England could help facilitate that.

D. NOISE AND VIBRATION

1. Are the locations of sensitive receptors and the areas most exposed to noise correctly identified by the applicant (ES Drawing 12.1)? Have the full impacts been properly assessed? If not, what further work should be undertaken?

1.1 Highways England considers that the locations of sensitive receptors and the areas most exposed to noise are correctly identified.

1.2 The study area was clearly defined in the Scoping Report (issued in August 2014). Subsequently, the Preliminary Environmental Information Report (issued November 2014) (http://www.highways.gov.uk/publications/m4-junction-3-to-12-smart-motorway-consultation-documents/) provided a set of drawings showing the study area for the noise and vibration assessment, identifying all of the sensitive receptors included within the assessment. There have also been a number of meetings with relevant local authorities (which are ongoing) to discuss the approach to the noise and vibration assessment (including the study area), the developing results from that assessment, and particular local issues for each local authority. No criticism has been raised at these meetings regarding the identification of sensitive receptors and areas most exposed to noise from major roads.

1.3 As stated in paragraph 12.1.3 of the ES (Application Document Reference 6-1), the noise and vibration assessment has been carried out in accordance with the requirements of the Design Manual for Roads and Bridges Volume 11, Section 3, Part 7, HD 213/11 Revision 1, which defines the study area for the noise assessment.

1.4 As stated in paragraph 12.2.33 of the ES, the study area for the assessment of construction phase impacts comprises a 1km area from the centreline of the Scheme, extended where appropriate to address offline construction compounds and construction traffic routes. Paragraph 12.2.34 of the ES notes that the study area for the assessment of operational phase impacts comprises an area extending 1km from the centreline of the Scheme and also includes other routes predicted to be subject to significant change in traffic conditions. Within the 1km buffer zone of the study area, a detailed study area has been defined which comprises a 600m

buffer around the Scheme and 600m corridors either side of any affected links, i.e. any road links which experience a significant change in traffic, and hence noise, as a result of the Scheme. There are no affected routes for the Scheme.

1.5 All sensitive receptors within the 1km buffer have been considered in the noise and vibration assessment (presented in the Chapter 12 of the ES) (Application Document Reference 6-1), and a detailed quantitative assessment has been provided for those receptors within the 600m corridors (limited to the Scheme).

1.6 London Borough of Hillingdon confirmed in its response to FRQ E4.7.1 that the locations of sensitive receptors and the areas most exposed to noise from major roads have been correctly identified.

1.7 In its response to FRQ E4.7.1, South Bucks District Council stated that it was satisfied that the sensitive receptors have been identified. However, South Bucks District Council added that "we are less sure that the full impact on all of them has been fully identified". South Bucks District Council did not provide any clarification as to why they considered this to be the case.

1.8 Highways England considers that the full impacts of the Scheme have been properly assessed.

1.9 As stated above, there have been a number of meetings with relevant local authorities to discuss the approach to the noise and vibration assessment, the results from that assessment, and particular local issues for each local authority. No questions have been raised at these meetings in respect of the full impacts being properly assessed.

1.10 Whilst Highways England considers that the full impacts of the Scheme have been properly assessed, it is noted in paragraph 12.4.112 of the ES (Application Document Reference 6.1) that there is potential to improve further the noise climate within the Scheme corridor. A qualitative appraisal of an enhanced mitigation strategy to achieve this is provided in Appendix 12.5 of the ES (Application Document Reference 6.3). This enhanced mitigation strategy comprises the provision of additional noise barriers, as outlined in Table A12.5.1 of Appendix 12.5 of the ES (Application Document Reference 6.3) and the replacement of some existing noise barriers with higher noise barriers, as outlined in Table A12.5.2 of Appendix 12.5 of the ES (Application Document Reference 6.3).

1.11 The effects of implementing this enhanced mitigation strategy have not been assessed in Chapter 12 of the ES. Hence, the assessment provided in Chapter 12 of the ES (Application

Document Reference 6.1) (which concludes that the vast majority of the Scheme corridor will experience noise reductions with the Scheme in operation) is very much a worst case.

1.12 Work is ongoing to provide a quantitative assessment of the enhanced mitigation strategy outlined in Appendix 12.5 of the ES (Application Document Reference 6.3).

1.13 Highways England confirmed that a requirement had been included in the latest version of the DCO to control noise during construction of the Scheme. Requirement 21 requires a scheme for noise management during construction to be approved, which will include noise management measures and monitoring of noise levels during construction of the Scheme.

2. To what extent has the study area for the assessment of noise and vibration including the spatial scope (study area) for both construction and operational phases of the scheme together with the identification of the 21 monitoring locations been agreed?

Highways England Response

2.1 In its response to FRQ E4.7.2, London Borough of Hillingdon confirmed that the baseline for the assessment of noise and vibration including the spatial scope (study area) for both construction and operational phases of the Scheme together with the identification of the 21 monitoring locations was agreed.

2.2 In its response to FRQ E4.7.2, South Bucks District Council provides the answer "no", but do not indicate whether they consider the study area or monitoring locations to be invalid. Whilst there has been no express agreement on this topic with South Bucks District Council, Highways England notes that no local authorities that have made a relevant representation have raised any form of comment regarding the noise monitoring locations or the study areas for the construction and operational phases of the Scheme.

2.3 Highways England, in response to a clarification request from the Examining Authority, clarified the study area for noise and vibration. The assessment was carried out in accordance with the DMRB which sets out the definition of "study area". The study area is a 1km buffer around the Scheme. Within that 1km there is a detailed study area comprising a 600m buffer around the Scheme and 600m corridors either side of any affected routes (affected routes are routes suffering a significant increase in traffic and therefore a consequent increase in noise levels of 1 dB or more as a result of the operation of the Scheme). Assessment at distances greater than 600m becomes uncertain. The assessment model also takes into account the topography of the area by placing all buildings and roads on a "digital model ground" at the correct height.

2.4 Highways England confirmed that there are no affected routes for this Scheme, so the detailed study area is 600m either side of the Scheme. Highways England agreed to consider a monitoring location in Lower Earley at more than 600m distance from the M4 motorway to consider the impact of the topography of the area. Highways England has provided a note in the additional representations document provided at Appendix A to this summary, explaining that (as noted in DMRB), outside of this 600 metre distance from the M4, the results of noise level calculations become uncertain, and thus comparison with measurement data would be unreliable. For this reason, Highways England does not intend to carry out any noise monitoring in this location. Mr Clive Jones, who attended Issue Specific Hearings and Open Floor Hearings, intends to carry out noise measurements in Lower Earley at significant distances from the motorway. Highways England can provide advice to Mr Jones on the appropriate methodology to employ for these measurements and on the interpretation of the measurements. However, it is unclear how these measurements can further inform the noise assessment presented in support of the DCO Application.

3. Is there any dispute as to the identification of the nearest sensitive receptor to each construction compound, which would be subject to the highest noise levels from construction compound activities? The results and assessment were reported in paragraphs 12.4.80 to 12.4.87 of the ES, with associated Table 12.15.

Highways England Response

3.1 No comments have been received questioning the identification of the nearest sensitive receptor to each construction compound, as employed in the noise assessment reported in paragraphs 12.4.80 to 12.4.87 (with associated Table 12.15) of the ES.

3.2 The assessment of noise impacts resulting from construction compounds will, of course, be revisited by the contractor when the detailed compound layouts and operations are fully defined and the contractor is seeking agreements with local authorities.

3.3 In response to questioning from the Examining Authority, Highways England clarified that the language of section 11.4.1 of the CEMP ("where it considers it to be required") reflects the use of the word "may" in s.61 of the Control of Pollution Act 1974. Any uncertainty over the duty of the contractor to interact with the local authorities is alleviated by Requirement 21 of the DCO which states that local authorities have to be consulted before construction begins.

4. The applicant's response to FRQ E4.7.6 refers to applications for consents under section 61 of the Control of Pollution Act 1974 for the proposed construction works, excluding non-intrusive surveys. Applications for Section 61 consents will include details on proposed working hours and construction activities to be carried out during those hours, including

night-time works. Any conditions included in consents /licences/permits will be documented in the final CEMP, secured by Requirement 8 (Schedule 2) of the dDCO. Are the local authorities satisfied with this mechanism proposed by the applicant to control hours of working and construction activities?

4.1 Slough Borough Council, South Bucks District Council and London Borough of Hillingdon were agreed that this was the appropriate process.

5. The applicant sets out the noise limits agreed with the local authorities on the M3 J2 to 4a scheme as possible limits for the M4 scheme. These are:

- *Daytime and evening: 75 dB LAeq, 1 hour (free field), with restrictions on times when piling works can be carried out;*
- *Night-time: 75 dB LAeq, 1 hour (free field), with restrictions on the types of activities that can be carried out.*
- *Suggested vibration limits, based on agreed limits with three Local Boroughs on the M3 J2 to 4a scheme, are:*
- *Trigger level of 1 mm/s peak particle velocity for occupied residential and educational buildings:*
- *Trigger level of 3 mm/s peak particle velocity for occupied commercial premises (applies to premises where work is not of an especially vibration sensitive nature and for potentially vulnerable unoccupied buildings); and*
- *Trigger level of 5 mm/s peak particle velocity for other unoccupied buildings.*

The procedures for managing noise and vibration would be documented in the CEMP. Are the local authorities satisfied that adequate protection would be afforded to sensitive receptors by the suggested approach?

5.1 Slough Borough Council, South Bucks District Council and London Borough of Hillingdon had reservations regarding night-time working and the restriction of certain activities and will be entering into dialogue with Highways England.

6. To what extent would the enhanced noise mitigation strategy (HE response to FRQ E4.7.15) affect the noise environment of sensitive receptors? Can the main beneficiaries (i.e. those currently most affected by noise and the extent to which noise would be reduced) be identified?

Highways England Response

6.1 As stated above in paragraph 1.12, work is ongoing to provide a quantitative assessment of the enhanced mitigation strategy outlined in Appendix 12.5 of the ES (Application Document Reference 6.3). Consequently, it is not possible to be definitive on the number of beneficiaries and the estimated noise decreases at this stage.

6.2 Table A12.5.1 of Appendix 12.5 of the ES (Application Document Reference 6.3) provides broad estimates of the numbers of properties benefitting and the likely noise reductions resulting from the provision of additional 2.5 metre high barriers (along with locations).

6.3 Table A12.5.2 of Appendix 12.5 of the ES (Application Document Reference 6.3) provides broad estimates of the numbers of properties benefitting and the likely noise reductions resulting from the replacement barriers with higher barriers (along with locations). The assessment of "higher barriers" looks at a range of sizes, from 2.5m up to 4m and looks at the varying benefits of increased height. The assessment considers the effects of the various sized barriers not only on homes close to the motorway but also those further back. Properties more than 600m are not specifically analysed but the general effect at distances greater than 600m is being considered.

6.4 The enhanced mitigation strategy is mainly focussed on those residential properties which would experience noise levels at or above the daytime and/or night-time SOAEL values with the Scheme in operation (although implementation of the Scheme generally results in noise decreases within the Scheme corridor). The daytime and night-time SOAEL values are defined in paragraphs 12.1.23, 12.2.21 and 12.2.22 of the ES (Application Document Reference 6.1). Residential areas that experience noise levels above the daytime or night time SOAEL levels with the Scheme in operation are identified in paragraph 12.4.100 and associated Table 12.18 of the ES.

6.5 Daytime and night-time noise levels, of course, go hand in hand, with those properties at or above the daytime SOAEL broadly corresponding to those properties at or above the night-time SOAEL, with a slightly greater spread of properties at or above the night-time SOAEL.

6.6 As stated in paragraph 12.2.21 of the ES, the daytime SOAEL is equivalent to a façade noise level of 68 dB $L_{A10,18h}$, which is the trigger level in the Noise Insulation Regulations 1975 (as amended 1988). The drawings accompanying the response to Question 10 show those residential properties with façade noise levels at or above 68 dB $L_{A10,18h}$ with the Scheme in operation (without the enhanced mitigation strategy in place). These properties are the focus of the enhanced mitigation strategy and will be the main beneficiaries (along with properties in the vicinity of these properties).

6.7 The approach adopted is drawn from WHO guidance in terms of developing an enhanced mitigation strategy, based on a health based approach. It is open to consultants and local authorities to assign levels to the SOAEL values. There does appear to be consensus on how SOAEL values are defined for road schemes, taking SOAEL as 63 dB LAeq in daytime and

adopting the World Health Interim Target Level of 55 dB at night. It would be expected that the majority of people in UK in the vicinity of the strategic road network would experience noise levels greater than 40 dB.

6.8 The enhanced mitigation takes the form of replacing existing barriers with higher noise barriers and provision of additional noise barriers. The mitigation to mitigate the effects of the Scheme itself is the provision of low noise surfacing for the complete extent of the Scheme and the provision of a small number of additional noise barriers. With this mitigation in place, there will generally be reductions in noise levels throughout the Scheme corridor with the Scheme in operation; minor in the short term and negligible in the long term ("negligible" is defined differently for the short term and the long term: in the short term it is a change of less than 1 dB, in long term it is a change of less than 3 dB). There are noise reductions throughout the Scheme corridor. The enhanced mitigation is to deal with those areas where, despite these reductions, noise levels are still high.

6.9 Highways England, in response to questions from the Examining Authority, reiterated that it is was not its intention to use earth bunds, and that in the locations that additional noise barriers are required, vertical noise barriers have been proposed. The reasons for not providing earth bunds are:

6.9.1 In acoustic terms, an earth bund can act as a noise barrier. However, given that its peak is further away from the motorway than a vertical noise barrier, it is not as effective as a noise barrier.

6.9.2 The land-take required for the footprint of an earth bund is far greater than a vertical noise barrier, which means the locations where an earth bund could be located within the Order limits are limited.

6.9.3 In construction terms, an extended construction period is required for earth bunds, which causes disruption for an increased duration and impacts on the construction cost. Other construction issues may also arise, depending on the location of the earth bund, such as access to the construction site or removal of vegetation.

6.10 Highways England confirmed that it had carried out a visual assessment of the existing noise barriers along the Scheme during the options identification stage of the Scheme development, supported by further assessment during preliminary design, but reiterated that it was not simple to determine if a current stretch of barrier is a noise barrier. The assumptions used on existing barriers will be checked.

7. *The applicant's response to FRQ E4.7.17 is noted. Has any survey work been undertaken to assess whether the allowance made in the calculations for noise reflections is realistic?*

Highways England Response

7.1 The Design Manual for Roads and Bridges (DMRB) requires that the noise calculations are carried out according to the methodology provided in Calculation of Road Traffic Noise (CRTN). This includes the calculation of the effects of barriers, which are assumed to be reflective.

7.2 It is not usual to carry out surveys to confirm this assumption. This assumption, that barriers are reflective, will provide a worst case assessment. To confirm, Highways England has not carried out a survey to measure the reflected noise opposite the barriers, a worst case assumption is being adopted.

8. A number of representations call into question the effectiveness of low noise surfacing as a mitigation measure, and imply that any benefits quickly deteriorate with road use. Can HE clarify whether low noise surfacing becomes less effective over the design life of a scheme, or are there measures that are taken to mitigate against any deterioration?

Highways England Response

8.1 All road surface types degrade over time, with consequent increases in tyre/road noise. However, like any surfacing, low noise surfacing, is replaced periodically with the life expectancy determined by the specific constituents, quality of construction and amount of traffic and environmental conditions. The typical life expectancy is between 10 and 15 years (ref paragraph 6.20 of HD37/99 amendment 1). The pavement is regularly monitored following installation using a variety of tests (e.g. skid resistance) and will be maintained to a high standard and then replacement scheduled once its performance is no longer satisfactory, in accordance with Highways England's standard procedures.

8.2 Research has indicated that, when new, low noise surfaces provide on average between 4 and 6 dB(A) benefit over tested hot road asphalt ("HRA") surfaces. In spite of the better acoustic durability of the HRA surfaces, low noise surfaces still outperformed the HRA surfaces by 1 to 3 dB(A) after 10 years (TRL Report PPR485: The Performance of Quieter Surfaces Over Time). The initial benefit of the Scheme of between 4 and 6 dB falls to between 1 and 3 dB after 10 years.

8.3 The -3.5 dB correction for a low noise surface, as prescribed in Design Manual for Roads and Bridges (DMRB), is a reasonable average over the life of the surface for calculation and assessment purposes. When the Scheme opens the benefits will be greater than 3.5 dB. There

will not be abrupt changes in the noise over time, abrupt changes being much more noticeable than gradual changes.

8.4 Highways England confirmed that it has a strategic network maintenance regime that would maintain the low noise surfacing. In addition, there is a provision in the DCO for low noise surfacing to be provided. There is a general requirement for Scheme maintenance secured in the DCO and a specific requirement relating to maintenance of the low noise surfacing will be considered.

9. How far are the local authorities and IPs satisfied with the applicant's amended schedule of noise barriers REP2-001, Appendix F - amended ES Drawing 12.2 which shows the locations and extent of new and replacement noise barriers?

9.1 Slough Borough Council, South Bucks District Council and London Borough of Hillingdon had reservations regarding the extent of new barriers and replacement barriers, which will form part of Highways England's consideration of the proposed enhanced mitigation strategy.

10. Can the applicant provide a schedule of properties in each local authority area which may experience a noise level of L10 (18-hour) of 68dB(A) or be entitled to noise compensation or insulation under the Land Compensation Act 1973 and Noise Insulation Regulations 1975 (as amended 1988)?

Highways England Response

10.1 Part I of the Land Compensation Act 1973 provides a means by which compensation can be paid to owners of land or property which has experienced a loss in value caused by the use of public works, such as new or improved roads. Noise and vibration are two of the factors which would be considered in any claim for compensation, but the claim should consider all changes and effects, including betterment.

10.2 Determination of compensation due to loss of value under Part I of the Land Compensation Act 1973 is a separate process, and does not form part of the noise and vibration assessment submitted as part of the DCO application. However, given the predicted reductions in noise levels due to the operation of the Scheme (as reported in Chapter 12 of the ES), Highways England are of the view that noise would not be a determining factor in any assessment of loss of value.

10.3 As stated in paragraph 12.4.106 of the ES, the results of the noise assessment indicate that no properties would qualify for noise insulation under the Noise Insulation Regulations 1975 (as amended 1988) (NIR). The NIR assessment will be revisited in greater detail during the Stage 5 detailed design work, although it is expected that the conclusions will be the same.

10.4 Drawings showing those properties predicted to experience a façade noise level equal to or greater than 68 dB $L_{A10,18h}$ with the Scheme in operation are appended to this response.

11. What type of noise barrier exists/is proposed for the property known as Hillside, Mill Lane, Sindlesham?

Highways England Response

11.1 The M4 motorway is on a bridge over Mill Lane. The property known as Hillside is on the west side of Mill Lane, just to the north of the M4 motorway. There are low concrete parapets on the bridge (less than 1 metre high) to the E/B and W/B carriageways. There are no other existing noise barriers in this location.

11.2 Proposed noise barriers to this location are provided in Table A12.2.1 of Appendix 12.2 of the ES (Application Document Reference 6-3). To the E/B carriageway, these barriers extend between chainages 48950 to 49150, 200m long. To the W/B carriageway, the barrier extends between chainages 49020 to 49070, 50 metres long.

11.3 Regarding the question on the type of proposed barriers (of 2m height), the construction / material is immaterial in acoustic terms as long as the sound reduction index of the barriers meets Highways England requirements. Provided this requirement is met, the barrier could be timber, metal or plastic and would be chosen to meet aesthetic needs.

11.4 It is noted that the Mill Lane area is included in the ongoing work on the enhanced mitigation strategy.

12. Would there be benefits in terms of noise reduction in the provision of a 3 metre acoustic fence for the length of the M4 on the Lower Earley side between J11 and 19, and around Black Boy roundabout at Shinfield and Winnersh?

12.1 Highways England is currently assessing the provision of enhanced mitigation (in the form of additional noise barriers and the replacement of existing barriers with higher barriers) along this stretch of the M4 between J11 and J10. Work is ongoing to provide a quantitative assessment of this enhanced mitigation strategy, based on a robust cost benefit analysis for each group of sensitive receptors, rather than the wholesale provision of noise barriers between junctions.

12.2 There would likely be benefits in terms of noise reduction with the provision of a 3 metre acoustic barrier, although, as stated in the previous paragraph, the height and lateral extent of this barrier (or barriers) would be determined from a detailed quantitative analysis.

12.3 In relation to the Black Boy Roundabout, Highways England confirms that this infrastructure does not form part of the Scheme and therefore no mitigation comprising additional noise barriers is proposed.

E. VISUAL IMPACT

1. In the applicant's response to FRQ, information is provided on the location and height of signs and gantries REP2-002, Section 4 Appendix C. Does this information assist IPs in their consideration of potential visual impact from the scheme?

1.1 No Highways England response is required on this matter.

2. Are winter views being prepared for the Landscape and Visual Impact Assessment (LVIA)? When will these be available for submission?

Highways England Response

2.1 Highways England has prepared three winter views in the Cranford Park area, in relation to the landscape and visual assessment. Highways England is of the opinion that these views are representative for users of the Park. However, six additional winter views of the previously prepared summer views at Cranford Park & Crane Meadows, which were requested by London Borough of Hillingdon, will be prepared in December 2015 (allowing for sufficient leaf fall to take place) and will be submitted at Deadline V.

3. In areas within the scheme where vegetation clearance will be necessary, are there locations where the area to be subject to replanting would be smaller than the original area of vegetation? Can such locations be identified? Would a reduction in the area of vegetation in these locations have an effect on the visual impact of the scheme?

Highways England Response

3.1 Yes, there are areas where the area subject to replanting is smaller than the original area of vegetation, because part of the area will be taken up by the new feature, be it an emergency refuge area, bridge, gantry, etc.

3.2 The locations where the replacement planting is less than the original area of planting will be included in a schedule to the DCO. The preparation of this DCO has identified one area, at Marsh Lane overbridge, where existing vegetation is indicated to be retained. There is also a photomontage of the view from Oak Stubbs Lane. Having discussed with the contractor, it is likely that more vegetation will need to be removed than initially envisaged. It is proposed that the photo-montage will be redone once the level of removal has been fully identified.

3.3 Where any of these location has the potential to impact on adjacent views, the visual effects are reported in Chapter 8 of the ES (Application Document Reference 6-1) and Appendix 8-3 has taken this in to account.

3.4 Highways England is prepared to enter s.253 agreements with landowners. Section 253 agreements are used to provide any planting to mitigate an adverse effect which the construction, improvement, existence or use of a highway has or will have on the surroundings of the highway. As such, Highways England will carefully consider where s.253 agreements are justified. A note on how s.253 agreements relate to the DCO is provided in Appendix A to this summary.

3.5 A table identifying the locations where the replacement planting is less than the original area of planting is provided at Appendix K to this Summary.

4. Does S Bucks DC consider that the additional information provided at Section 4 Appendix C of the applicant's response to FRQs REP2-002 helps in assessing whether the Zones of Visual Impact (ZVI) and LVIA are adequate?

4.1 No Highways England response is required on this matter.

5. Are the LPAs content that the viewpoints used in the LVIA are representative?

5.1 No Highways England response is required on this matter.

6. The applicant states that the main carriageway lighting will be replacements to the existing lighting and will use modern light emitting diode (LED) luminaires which control light distribution. LEDs are also to be used for gantry lighting. As a result there would be less lighting spill and less light pollution than from existing lighting. However, will there be lighting in new locations as a result of, for example, changes to slip roads and bridges? Can locations where the position of lighting will change please be identified and the effects of such change be described for the hearing?

Highways England Response

6.1 As detailed in paragraph 6.3.44 of the Engineering and Design Report (application Document Reference 7.3) the (street) lighting design will be finalised during Detailed Design on the following Assumptions:

6.1.1 all the existing sections of the motorway, slip roads Huntercombe Spur, and side roads within the Order limits at Wood Lane and Datchet Road overbridges and the south approach to the Recreation Ground overbridge that are currently lit will remain lit; and

6.1.2 the unlit section between junction 8/9 and junction 10 and the side roads at Lake End Road, Ascot Road, Monkey Island, Marsh Lane, Oldway Lane, Riding Court Lane and Old Slade Lane overbridges will remain unlit.

6.2 Whilst detailed design of the street lighting locations will not proceed until after the examination period, Highways England can confirm that local adjustments will be required at bridge locations, slip roads and localised sections of mainline realignments. The locations where the position of the lighting may change would be at:

6.2.1 The lit slip roads at the junctions along the Scheme would be realigned to the north or south of their present positions. At the M4 Junctions 12; 11; 10; 8/9; 6; 5; 4 and 3 the alignments would be marginally closer to residential properties;

6.2.2 The lit mainline at Huntercombe Spur would be realigned 5.5m to the east of its present position and marginally closer to residential properties on West Point, although the adjacent lit eastbound on-slip would be unaffected;

6.2.3 The lit mainline carriageway in the vicinity of Thames Bray would be realigned 4m to the north of its present position and marginally closer to the Amerden Caravan Park;

6.2.4 The lit Wood Lane overbridge would be realigned 20m to the east of its present position and further away from the properties on Wood Lane;

6.2.5 The mainline carriageway in the vicinity of the Windsor Branch railway underbridge would be realigned 4m to the south of its present position. It is anticipated the eastbound slip road verge lighting closest to the residential properties would remain at its present location;

6.2.6 Datchet Road overbridge would be realigned 22.5m to the east of its present position and further away from the properties at the Myrke; and

6.2.7 Recreation Ground overbridge would be online and the lighting to the approaches would remain at its present location

6.3 Gantry illumination will be provided throughout the Scheme.

7. A submission has been received from a resident of Holyport Road Maidenhead concerning new lighting which has been installed on the M4 in the vicinity of his property. Is that new lighting using LED luminaires?

Highways England Response

7.1 This new lighting does use LED luminaires which were replaced as part of a routine maintenance upgrade by Highways England's maintenance team. However the LED luminaire has been retrofitted to the existing lighting columns at a 5 degree tilt. The Scheme will provide new lighting columns which project the luminaires at a zero degree tilt which will marginally reduce the amount of light visible from the property however as the property is low down the luminaire will, like the original and current luminaires will be visible.

8. An assessment of night-time construction lighting is currently being prepared to be submitted by Deadline III (5 November 2015). Any issues relating to this assessment to be discussed at the hearing.

Highways England Response

8.1 Highways England confirms the document identified was submitted for Deadline III.

9. Residential receptors at Winvale would experience a reduction in the depth of the planting which screens the M4, and the introduction of Gantry G4-16 which would be a prominent element in the view (FRQ E4.2.10). The applicant states that mitigation through planting within the highway boundary is not an option, neither is the relocation or reduction in size of Gantry G4-16. Has the potential for off-site planting been investigated?

Highways England Response

9.1 No off-site planting under a section 253 agreement has been investigated between the affected properties and the proposed Gantry due to limited available space for planting within an area for garages and associated hardstanding. It is unlikely that with the limited scope for off-site planting at this location, that any additional planting outside the Order limits would reduce the moderate adverse effects of the Scheme. However Highways England will consider whether a s.253 agreement is required in this location on the basis set out above.

10. The occupiers of residential properties in Keats Way, West Drayton would also experience permanent visual impacts because of the reduced width of the tree belt which screens the M4 (FRQ E4.2.10). Has the potential for off-site planting been investigated?

Highways England Response

10.1 No off site planting under a section 253 agreement has been investigated due to limited available space for planting at the rear of the properties and the retained section of existing trees. It is unlikely that with the limited scope for off-site planting at this location, that any additional planting outside the Order limits would reduce the moderate adverse effects of the Scheme. The landscape and visual impact assessment is a worst case scenario in terms of vegetation clearance during the construction. With reference to paragraphs 8.4.16, 8.4.17 of the ES and Appendix 8.4, item 8.12, every effort will be made to minimise the extent of the

vegetation removal at this location. However Highways England is prepared to enter into an s.253 agreement if a landowner affected by the Scheme requests off site planting.

11. Concern has been raised by some residents whose properties abut the boundary of the M4. In some cases they consider that vehicles using the former hard shoulder would be able to see directly into the windows of their houses. This is particularly the case where the motorway is on an embankment above the level of the dwellings (e.g. Holyport Road, Maidenhead), and may also be the case if there are any instances of properties which are on a higher level than the motorway. Has the applicant given any thought as to how these concerns might be addressed?

Highways England Response

11.1 The concern raised by some residents regarding overlooking from vehicles on the proposed M4 nearside lane can only best be understood by visiting the properties affected as a window facing the M4 is a relatively small aperture in the context of views from transient traffic on it. The ability to see in to a window from moving traffic is subject to a number of variables. These include distance, viewing angle (which changes in relation to the elevation and angle of the window to the carriageway), light levels within the room compared to external light levels, intervening elements such as seasonal changes in summer and winter vegetation and traffic speed.

11.2 We are aware of a concern regarding overlooking at Mill Lane and Holyport Road, Maidenhead, through the representations made by the residents at these locations. The respective locations for these receptors are illustrated on Figure 8.3 sheet 5, receptor 5.1.9 and sheet 9 receptor 9.1.5 of the ES (Application Document Reference 6-2). At these locations the adjacent 2m high noise barrier will screen views from cars, although users of higher vehicles such as drivers of articulated lorries and coach travellers will be able to see over the top of the adjacent barrier and the windows at these properties during the winter months would be perceptible through the leafless deciduous vegetation, but very minor elements in the view. The above two locations fall within the study area of the enhanced mitigation strategy.

11.3 From a review and recent winter drive through of the Scheme using aerial mapping, Highways England is not aware of any other instances e.g. blocks of flats where windows are higher than the motorway and where overlooking would be a potential issue. Where residential properties (flats) are adjacent to Scheme, with elevated windows higher than the M4 carriageway, it appears that there is enough distance and / or intervening existing vegetation (which is not affected by the Scheme), suggesting overlooking is unlikely to be an issue.

12. Do the changes to acoustic fencing proposed in the amended schedule of noise barriers REP2-001, Appendix F - amended ES Drawing 12.2 have any effect on the assessment of visual impact?

Highways England Response

12.1 The enhanced mitigation strategy is presently ongoing. In advance of the final version of the review, in principle it is considered that taller noise barriers could potentially provide visual benefit from adjacent receptors by screening traffic, particularly where noise barriers are not present or where by making them taller they would screen high sided vehicles. However, where barriers are constructed adjacent to existing vegetation there may be the need for further vegetation clearance in order to install them. This would potentially result in increased visual intrusion during the construction, but in the short term, post-construction, they may provide visual benefits during winter by screening the traffic.

12.2 A visual assessment for the enhanced mitigation strategy will be carried out once the noise enhancement measures have been finalised.

F. WATER ENVIRONMENT

1. No Statement of Common Ground (SoCG) between the Environment Agency (EA) and HE had been received at the time the agenda was prepared. EA and HE are requested to prepare to inform the hearing of the latest position and set out their case in respect of any areas of disagreement between the two parties.

Highways England Response

1.1 Highways England has continued discussion with the EA since Deadline II and held a meeting with them to discuss outstanding issues on 28 October 2015. Highways England issued a revised draft SoCG on 2 November 2015 and, following further discussion, the EA issued a statement on 5 November 2015, which they asked to be submitted to the ExA. That statement was provided to the ExA in Highways England's Position Paper on SoCG submitted at Deadline III.

1.2 Following the submission of additional Flood Risk Assessment ("FRA") information on the 4th November this matter has been progressed via two further teleconferences with the Environment Agency resulting in a submission of further FRA information on the 12th November. This information has been subject to a high level review by the EA, the outcome of which was discussed in a teleconference on the 16th November and a meeting on the 23rd November. As a result, a revised FRA is being submitted at Deadline V. Highways England and the EA are working closely to finalise the SoCG as soon as possible. It had been the parties' intention to submit that SoCG on or before Deadline IV. However, due to on-going

discussion, that has not been possible. A signed SoCG will therefore be submitted to the Examination as soon as possible following Deadline IV.

A. *Flood Risk Assessment does not fully assess the impact of the scheme on flood risk as quantified losses of floodplain storage have not been properly calculated. It also states that all of the proposed surface widening is within flood zone one, whereas parts are within zones 2 and 3.*

Highways England Response

1.3 As noted within Highway England's response to the Environment Agency's Written Representation, since submission of the FRA at the Application stage (Application Document Reference 5-3) further work has been on-going to locate all sites along the Scheme where any works (including proposed surface widening) are required in the 1 in 100 year plus climate change floodplain (which defines the extent of Flood Zone 3), to quantify the extent of floodplain storage loss due to these works and to determine what compensation, if any, may be required as a mitigation measure.

1.4 Where mitigation is required, compensation will take a mixed form of provision, on a level for level and volume for volume basis and will be designed to ensure that the compensation area is hydraulically linked to the floodplain. The flood storage compensation provided will mitigate for loss of storage for all flood events up to and including the 1 in 100 year flood event with an allowance for climate change, in line with EA requirements and this mitigation will be secured by the inclusion of a further requirement in the DCO in relation to flood compensation, which is reflected in the latest draft DCO submitted at Deadline III. This additional information was reported in the updated FRA submitted at Deadline III, which has quantitatively confirmed that the proposed works will have no impact on upstream or downstream flood risk.

1.5 Highways England has re-assessed the potential for the Scheme to impact on flood risk using detailed modelled flood water level data, supplied by the Environment Agency. A further updated FRA will be submitted at Deadline V and this will be informed by Highways England's recent consultation with the Environment Agency. It is Highways England's understanding that the Environment Agency is now satisfied that there is enough space within the Order limits to accommodate the floodplain compensation schemes.

B. *It is not clear how much land raising would be within the flood plain in the surface widening between J5-6 and J12-11. Mitigation is only proposed for surface water runoff. If losses of floodplain storage have not been properly quantified and downstream impacts not properly assessed then it cannot be certain that flood risk will not increase as a result of the proposed works. Has this been addressed by the applicant?*

Highways England Response

1.6 This has been addressed in an update to the FRA submitted at Deadline III. Sites within the Scheme where works in the 1 in 100 year plus climate change floodplain are required are illustrated in a series of drawings provided as Annex G to the updated FRA submitted at Deadline III. The quantitative amount of land raising within the floodplain has been calculated and mitigation for any floodplain storage loss has been assessed at all sites for which Highways England has received Environment Agency data. For all sites where floodplain compensation ("FpC") is required, information is provided in the updated FRA submitted at Deadline III that demonstrates that a mitigation solution is feasible and that flood risk will not therefore increase as a result of the proposed works. A mechanism to secure the floodplain compensation is included in the latest draft DCO.

1.7 It has been demonstrated that at all sites where floodplain storage would be lost, sufficient land is available within the Order limits to compensate for losses, with scope to provide over and above the volumes lost. As current assessments have utilised LiDAR data rather than detailed topographical survey data this should provide comfort to the Environment Agency.

1.8 A meeting took place on 23 November 2015 with the Environment Agency to discuss in detail, on a site by site basis, the proposals for ensuring hydraulic connectivity between the proposed floodplain compensation areas and the wider floodplain, to ensure that floodwaters are practically able to flow into the sites of compensation storage and drain once the flood event has receded, such that a 'no increase' in flood risk result will be achieved. The outcomes of this meeting will be incorporated into the further update to the FRA to be submitted at Deadline V.

1.9 It should also be noted that all of the floodplain compensation assessments will need to be revisited during the detailed design phase of the Scheme once Highways England has detailed topographical data, which will be collected through bespoke surveys. The Environment Agency acknowledge and accept this approach..

C. Application does not give sufficient information on length or design of proposals to extend culverts.

Highways England Response

1.10 Further information on the design proposals for the two extensions of existing culverts were provided in HE's response to the EA's WR submitted at Deadline III (paragraph 15.3.2). This notes:

"There are only two culverted watercourses classed as main rivers where the culverts will be altered by the Scheme:

- *Chalvey Culvert, west of junction 6 and shown as work number 15 on sheet 21 of the Works Plans (Application Document Reference 2.3). This is a 3.66m span box culvert which will be widened at each end to accommodate all lane running. Details of the proposed design can be seen in the general arrangement drawing in Annex F2 of the EDR (Application Document Reference 7.4), which shows culvert bore extensions of 2.91m to the north and 3.43m to the south.*

- *Ashley's Arch Culvert, between junction 5 and Riding Court Road Overbridge and shown as work number 23b on sheet 24 of the Works Plans. There are two elements to this culvert: a 6.1m span box culvert and a 1.5m diameter pipe culvert. No alterations are proposed for the box culvert but the pipe culvert will be widened to the north to accommodate all lane running. Details of the proposed design can be seen in the general arrangement drawing in Annex F2 of the EDR which shows culvert bore extension of 1.2m to the north."*

1.11 Alterations to the culverts will be designed in accordance with DMRB requirements. Highways England understands the need to consult with and gain approval from the Environment Agency when designing changes to watercourses and culverts, as secured by paragraph 13.2.1 of the Outline CEMP, and confirms that all relevant consents would be sought from the Environment Agency for the culvert extension works.

D. Clarification is sought on several issues, including why Water Framework Directive Compliance Assessment (WFDCA) has identified 19 surface water bodies that may be impacted by the proposed works whereas only three of these were taken forward to a stage 4 assessment; and if the correct waterbody had been assessed for Chalvey Ditch?

Highways England Response

1.12 Following information provided by Highways England at Deadlines II and III, the Environment Agency are satisfied that its assets are capable of protection with regards to the requirements of the Water Framework Directive, and that this is secured through requirements in the DCO.

1.13 During Stage 2 Baseline Collation of the WFD Compliance Assessment, some 60 waterbodies were identified along the Scheme, of which 19 are classified as WFD waterbodies in Annex B to the Thames River Basin Management Plan ("RBMP"). Of these 19 classified WFD water bodies, only three, the River Thames, Chalvey Ditch and Datchet Common Brook, are likely to be affected by the construction of the Scheme, which may in turn affect achievement of the

WFD objectives for those waterbodies, as shown in Table 6.1 of the WFD Compliance Assessment (Application Document Reference 7-6). Consequently, only these three waterbodies were taken forward for assessment in Stage 4, as outlined in paragraph 6.1.3 of the WFD Compliance Assessment. The remaining 16 WFD classified waterbodies identified along the Scheme in Table 5.1 of the WFD Compliance Assessment, have been screened out of the preliminary assessment and have not been taken forward to Stage 4, as it is considered that the proposed works will not directly affect these waterbodies or have the potential to compromise achievement of their WFD objectives (paragraph 6.1.4).

1.14 Highways England confirms that water body ID GB106039023470 (Chalvey Ditch) is scoped in for further assessment rather than GB106039023550 which actually flows under the M4. A comparison of the two water bodies was made, and provided to the Environment Agency in Appendix B in our response to their written representation submitted at Deadline III. As a result of this comparison, Highways England is of the opinion that the difference between the WFD attributes of the two water bodies are minor - the overall status of the two water bodies is the same at present with the same overall status objective of good by 2027. Furthermore, within the comparison of the two water bodies, the correct water body (ID GB106039023550), is justified as being disproportionately expensive as well as technically infeasible for reasons to why the overall objective is not good by 2015. The incorrect water body (ID GB106039023470) was only classified as technically infeasible.

1.15 The other two differences in terms of the baseline data as reported in the WFD Compliance Assessment Table 5.1, is a moderate score for fish biological elements in the correct water body rather than the water body scoped into the assessment which is classified as high. Finally, there is no information on supporting chemical elements for the correct water body as opposed to the incorrect water body scoped into the assessment which displays numerous chemical information within the WFD Compliance Assessment.

1.16 In addition there are no additional mitigation measures as outlined in the Thames RBMP, which are assigned to the correct water body (GB106039023550) which were not in place for the incorrect water body (GB106039023470). Instead, two of the three potential conflicts between the Scheme and maintenance or implementation of the RBMP mitigation measures, as outlined in the WFD Compliance Assessment for Chalvey Ditch, can be removed as they are not in place for the correct water body reference. These two potential conflicts are:

1.16.1 Removal of hard bank reinforcement/revetment, or replacement with soft engineering solution; and

1.16.2 Retain aquatic and riparian habitats (channel alteration).

1.17 Based on this comparison, the conclusions of the assessment with regard to the Chalvey Ditch remain applicable. Accordingly, there was no need to carry out further assessment in relation to water body GB106039023550.

E. EA does not agree that the impact on ecology is neutral as set out in table 9.5 of the ES, due to impact on river habitats as a result of bridge widening and culvert lengthening. EA notes that any net loss of habitat is not supported by NPSNN and seeks further assessment is undertaken to identify what levels of compensation may be required. What is the applicant's position on this?

Highways England Response

1.18 The Environment Agency, in their written representation, quoted NPSNN paragraph 2.25, stating: "development should avoid significant harm to biodiversity and geological conservation interests, including through mitigation and consideration of reasonable alternatives. The applicant may also wish to make use of biodiversity off-setting in devising compensation proposals to counteract any impacts on biodiversity which cannot be avoided or mitigated." In the same paragraph, NPSNN goes on to state: "Where significant harm cannot be avoided or mitigated, as a last resort, appropriate compensation measures should be sought."

1.19 Highways England has identified the loss of small areas of water course habitats which would result from the Scheme which are summarised in the following table:

Location	**In-channel habitat loss (area)**	**Description**
Chalvey Culvert	Approximately 22m^2	Extension of culvert by a total of 6.34m, occupying entire channel width.
Ashley's Arch Culvert	Approximately 4.5m^2	Extension of pipe culvert (relief channel) by 1.2m, occupying entire channel width.
Thames Bray Bridge	Approximately 50m^2	Two construction areas, 1x 10m^2 and 1x 40m^2, occupying part of the (45m wide) channel, to facilitate the widening of the bridge by 7.8m.

1.20 The losses to in-channel habitats have been assessed as not significant, and because of this, no direct replacement of in-channel habitats has been proposed. Within the ES, water course habitats are included under the receptor heading 'Habitats and plants'. The effects of the Scheme on all habitats and plants has been assessed as 'Neutral'.

1.21 Highways England has not chosen to use biodiversity off-setting to devise compensation proposals. However, in compliance with national policy including the NNNPS (paragraph 5.29) opportunities for biodiversity enhancement measures within the Order limits have been sought, including the provision of: wildflower seed mix for grassland reinstatement; native trees for tree planting; otter ledges at culverts or underbridges; 60 bat boxes; 40 bird boxes; and the removal of invasive species to maximise the biodiversity benefits of the Scheme (see paragraph 9.4.117 of the ES (Application Document Reference 6-1)). These measures are outlined within the paragraphs 9.4.118 to 9.4.124 of the ES and secured by requirement 24 in the draft DCO.

1.22 Highways England notes that Natural England has been consulted in relation to the Scheme and, in their Written Representation, stated: "we therefore have no outstanding issues or concerns with regard to this project". Highways England and Natural England have agreed a Statement of Common Ground and there are no matters not agreed.

F. Are there any other WFDCA issues which remain to be resolved?

Highways England Response

1.23 Highways England is content that the issues relating to the WFDCA highlighted by the Environment Agency have been addressed in the response to the Environment Agency's written representation. As a result Highways England does not consider that there are any issues which remain to be resolved.

2. LB Hillingdon

A. Does not agree that a complete WFDCA has been undertaken as it does not include the potential impact of culverting of Frogs Ditch. Has this been a subject of discussion with the applicant?

Highways England Response

2.1 Measures to ensure the management of surface water, specifically that there is no detriment to existing water quality and no increase in flood risk from this source during the construction phase of the Scheme, are set out in Chapter 14 of the Outline CEMP. Measures include a

commitment to comply with BS 6031 Code of Practice for Earthworks (BSI, 2009c) regarding the general control of site drainage, The Control of Pollution (Oil Storage) (England) Regulations 2001 that apply in relation to storage of any oil-based materials, and all relevant Environment Agency Pollution Prevention Guidelines.

2.2 Further information has been provided by Highways England via their responses to the Hillingdon Local Impact Report ("LIR"). Highways England confirms that the Water Framework Directive ("WFD") assessment (Application Document Reference 7-6) is based on those watercourses monitored under the Thames River Basin Management Plan ("RBMP"), with WFD defined classifications on the Environment Agency's website. Frog's Ditch is not included in the Thames RBMP and is not classified as a WFD on the Environment Agency's website. Consequently, the absence of information for Frog's Ditch precludes the inclusion of this water body in the WFDCA.

2.3 Frog's Ditch has been identified as a receptor with the potential to be impacted by the Scheme in Table 15.11 of the Environmental Statement ("ES") (Application Document Reference 6-1). Table 15.20 of the ES presents a summary of the potential likely effects on the water quality (and flood risk) attributes of this waterbody and also details the mitigation measures that will be put in place, secured via the CEMP, to ensure that the quality of Frog's Ditch does not deteriorate.

2.4 Highways England is currently investigating what engineering options are possible for Frogs Ditch but can confirm that no culverting or diversion of the ditch will be required and that this watercourse is not proposed to be used to facilitate hydraulic connectivity to a floodplain compensation area. This will be detailed in the updated FRA to be submitted at Deadline V.

B. Does not consider that the scheme will deliver the reduction in flood risk as required in the National Planning Policy Framework (NPPF) since improvements are restricted to areas where works will be. What is the applicant's position on this matter?

Highways England Response

2.5 Highways England concludes that the proposals are compliant with key flood risk planning policy requirements, including the National Planning Policy Framework ("NPPF"). The design of the Scheme is such that floodplain compensation will be provided on a volumetric equivalent, and where feasible level for level basis. Compensation will be provided for any loss of storage up to the 1 in 100 year storm event plus an allowance for climate change. The design principle assumes that the Scheme drainage will mimic the response of the current highways drainage catchment. Highways England have worked on the assumption that the

existing drainage system is fit for purpose and if found not to be, will be rectified, as set out in paragraph 1.3.17 of the Drainage Strategy Report (Application Document Reference 7-5, App-123), an updated version of which will be submitted at Deadline V.

2.6 Where possible existing discharge rates from new paved areas created within the Greater London section of the Scheme will be attenuated using oversized pipes, manholes or collector systems such as a beany block collector at an ERA.

2.7 Where works are required in the central reserve and verge, existing traditional gulley drainage infrastructure will be replaced with a slot drainage system (which is more efficient with regards to use of space). The slot drainage system provides additional storage capacity and therefore attenuation for runoff compared to the existing drainage infrastructure, which should contribute to the Scheme overall achieving a minor benefit with regards to managing and attenuating surface water runoff discharges. Highways England confirmed at the hearing that it is in discussions with the London Borough of Hillingdon on this matter and would make every effort to provide the additional information that is to be incorporated into the Deadline IV submission. However, following further discussions with the EA, Highways England considers that it is appropriate to delay the submission of a further update to the FRA until Deadline V so that the document can reflect all changes required.

3. As the lead local flood authority, Bucks CC requires agreement on detailed drainage design to be agreed. Has the authority's concerns re the use of conventional oversized pipes and gullies been addressed?

Will enhancements to water courses and biodiversity be achieved through the effective use of sustainable drainage systems (SuDS)?

Highways England Response

3.1 In the current version of the SoCG between Buckinghamshire County Council and Highways England, it is not agreed that sustainable urban drainage systems ("SuDS") should be provided as part of the Scheme, as requested by Buckinghamshire County Council. The primary constraint on incorporating SUDS features (such as swales, ponds etc.) is space. The Order limits have been defined with the emphasis on minimising land take, so that additional capacity is provided by converting the hard shoulder to a running lane while minimising the impacts on adjoining landowners and the environment. To achieve minimal land take, as documented in the Drainage Strategy Report (Application Document Reference 7-5, App-123), the drainage design seeks to use existing drainage systems (with repairs/upgrades undertaken where necessary) and outfalls, with provision of attenuation storage where

necessary, for example for the Emergency Refuge Areas, so that discharge rates do not exceed current rates.

3.2 The drainage strategy considers both rates and volumes of discharge and this commitment is set out in paragraphs 1.2.3 (points e and f) of the Drainage Strategy Report (Application Document Reference 7-5, App-123), an updated version of which will be submitted at Deadline V.

4. Will HE be seeking to disapply the flood defence consenting regime as set out in Water Resources Act 1991 and land drainage bylaws?

Highways England Response

4.1 Highways England is not seeking to dis-apply the flood defence consenting regime, and confirm that all required consent applications will be lodged at the appropriate time.

5. In response to South East Water's (SEW) concerns, HE can perform a hydrogeological risk assessment in order to demonstrate to SEW that groundwater resources will not be impacted upon. Can a SoCG be produced between HE and SEW once the results are available?

Highways England Response

5.1 It is agreed that Highways England will prepare a SoCG demonstrating that the groundwater resources will not be impacted and submit for and pursue agreement with SEW.

5.2 A hydrological risk assessment is underway and is due to be finished by the end of December 2015. Highways England notes the Examining Authority's request to receive the hydrological risk assessment and a SoCG with South East Water at the earliest opportunity and will make every effort to submit these documents prior to Deadline V.

6. Can the applicant clarify the latest position regarding management of surface water and the latest position reached having regard to concerns expressed by SEW?

Highways England Response

6.1 Highways England confirms that further information has been provided to South East Water ("SEW") in an effort to address their concerns.

6.2 Highways England confirms that draft drainage consent applications and method statements outlining proposed pollution prevention techniques will be submitted to SEW and other relevant water authorities for their approval prior to commencement of any construction activities that could have the potential to impact water quality.

6.3 Highways England's legal advisors have been in contact with SEW in relation to the negotiation of the protective provisions for the benefit of SEW, which have been provided at Part 1 of Schedule 9 to the DCO. Highways England will continue to engage with SEW in relation to those protective provisions and await receipt of SEW's comments.

6.4 Highways England also agrees to keep SEW fully informed as the Hydrogeological Risk Assessment and ground investigation progress. This assessment is shortly to commence and will be completed by the end of Examination.

7. Can HE explain the process by which pollution protection measures will be secured for water which is discharged from new or relocated drainage systems?

Highways England Response

7.1 The fundamental principle of the drainage design for the Scheme is not to relocate existing surface water collection drainage carrier pipes or outfalls and it is not anticipated that any relocation of this infrastructure would be required. However, if following the detailed design phase it is necessary to relocate surface water carrier pipes or create new outfalls then pollution control and protection measures will be provided. These measures may include, settlement and treatment of highway runoff via oil and silt traps, prior to discharge to the receiving waterbody. The requirement for pollution control and protection measures will be secured via their inclusion in the CEMP, which also includes details of pollution incident control and monitoring protocols.

7.2 This mitigation strategy will be further informed by the results of a Hydrogeological Risk Assessment that is to be carried out to assess quantitatively the potential impacts of any construction activities on the South East Water's potable water abstraction site at Beenham's Heath. Site specific mitigation measures will be added to the final CEMP.

7.3 In addition, to ensure that there is no risk of pollution associated with the operational phase of the Scheme, Highways England will submit consent requests to the relevant water authorities for approval, prior to commencement of any drainage works linked to the relocation of existing surface water collection drainage carrier pipes or outfalls.

8. Have the potential impacts on the physical nature of the channel and the biological quality of the watercourse at the River Thames at Bray been properly assessed?

Highways England Response

8.1 Highways England considers that the impact of the Scheme on the River Thames at Bray has been properly assessed.

8.2 Physical nature of the channel: The extent of watercourse channel that will be lost at Thames Bray is approximately 50m2, comprising two working areas, one 10m2, and another 40m2, at a location where the river channel is approximately 45m wide. The loss of these small parts of the river channel has been assessed in the Environmental Statement (Application Document Reference 6-3) as a 'negligible' impact (defined as: 'Very minor loss or detrimental alteration to one or more characteristics, features or elements').

8.3 Biological quality of the watercourse: A quantitative assessment of biological water quality was not presented within the ES, because it was not considered necessary to collect detailed water quality data in order to assess the likely impact of the works. However, during autumn 2015 Highways England commissioned an aquatic macroinvertebrate survey to provide upstream and downstream data for biological water quality. This data will be used as a baseline for construction phase monitoring. The full results of this survey are not yet available, but the surveys have identified that: the River Thames was of good-to-very-good quality within the area surveyed, and supported relatively diverse communities typical of a large, fast-flowing river, including several pollution-sensitive taxa. These elements suggest that the macroinvertebrate communities are likely to be sensitive to any changes in water quality, and to any contaminant or sediment inputs that might arise from the works. However, the assessment also demonstrated that the River Thames at the sites surveyed is colonised by no species of particular conservation value, with most species recorded being very common.

8.4 These measures will be updated for the Statement of Common Ground between the Environment Agency and Highways England that will be submitted as soon as possible after Deadline IV.

G. OTHER MATTERS

1. A Health Impact Assessment was provided at Deadline III by the applicant. Can the LPAs and statutory authorities, in particular PHE, give their considered opinions on the assessments of impacts and recommendations?

Highways England Response

1.1 The Health Impact Assessment clearly states how its overall conclusions were reached. This is provided, in particular, by Table 22, which sets out the analysis of every element of the Scheme against health benefits and sets out the effects of the Scheme.

1.2 During construction, the HIA concludes that the majority of effects are minor, with a balance of both minor positive and minor negative effects. Health determinants that are predicted to experience negative changes include access to social infrastructure; recreation and green

space; active travel; air quality; noise and vibration; soil and water pollution; and community safety and stress. Key effects that may affect health relate to community severance; and increased stress, resulting from construction activities. Minor positive effects may be experienced for health determinants relating to access to work and training; and minimising the use of resources.

1.3 During Scheme operation, the HIA concludes that the majority of the predicted impacts on health are positive, although minor negative effects are predicted against health determinants relating to air quality and recreation and green space. Positive effects on health have been predicted against health determinants relating to: access to social infrastructure; active travel; noise and vibration; community safety and stress; access to work and training; and minimising the use of resources.

1.4 The HIA strongly supports the adoption of mitigation measures as set out in the ES. Further, key mitigation measures of relevance to health are summarised in the Outline CEMP (Appendix 4.2A of the ES) (Application Document Reference 6.3, APP-293).

1.5 The over-arching approach for the M4 junctions 3 to 12 smart motorway scheme (the "Scheme") is to replace those overbridges affected on a like-for-like basis in terms of their function.

1.6 In response to a query by the Campaign for Better Transport, it is acknowledged that a number of the existing overbridges are used by cyclists, as demonstrated by the Non-Motorised User ("NMU") survey undertaken in June 2015. A summary table showing the results of the survey is provided below; surveys were undertaken over a 12 hour period on each day:

Bridge	Northbound		Southbound		Dates of Survey
	Footpath	Carriageway	Footpath	Carriageway	
Marsh Lane	6	48	2	50	Wednesday 3 June 2015
	19	127	14	110	Saturday 6 June 2015
Oldway Lane	0	3	0	4	Wednesday 3 June 2015
	12	22	0	22	Saturday 6 June 2015

Recreation Ground	14	54	1	73	Wednesday 3 June 2015
	11	52	0	72	Saturday 6 June 2015
Old Slade Lane	0	3	0	4	Wednesday 3 June 2015
	0	5	0	4	Saturday 6 June 2015

Table 1 – NMU survey results (cyclists)

1.7 However, it is noted that none of the existing side roads or associated overbridges have a dedicated cycleway within the verge provisions. Therefore, under the over-arching approach for the Scheme, proposals to re-align or alter side roads and replace overbridges are based on shared use of footpaths by pedestrians, cyclists and in some cases equestrians in line with the highway design standards.

1.8 The provision of dedicated facilities for separate usages would require an increase to the width of the bridge and associated embankments to accommodate the wider cross-section of the structure. This in turn would be likely to require additional land-take, which may impact further on local residents and ecology dependent on the location of the structure. In addition, the construction programme for the structure would be likely to extend and construction costs increase to accommodate the additional works.

1.9 Furthermore, it is evident from the NMU survey that cyclist usage of the overbridges over each of the 12 hour periods is not particularly high and thus dedicated provisions to accommodate such movements would be difficult to justify when compared to the additional impacts that would arise as part of the works.

2. To what extent do the draft EMP, CEMP and HEMP provide sufficient information on mitigation measures? Is it clear how the documents will interact in their implementation?

Highways England Response

2.1 The Outline Environmental Management Plan ("EMP") in Appendix 4.2-A to the Environmental Statement ("ES") (Application Document Reference 6-3, APP-299) provides an over-arching framework for environmental management during design, construction and operation of the Scheme (paragraph 1.3.2). The Outline EMP comprises:

2.1.1 Main Report: A short report setting out the approach to environmental management during design, construction and operation. The report includes:

i. Section 2: an overview of environmental management during design, construction and operation;

ii. Section 3: a requirement to compile a register of consents and permissions required for the Scheme;

iii. Section 4: a summary of environmental risks, the mitigation measures required to address them and the responsible organisation in Table 4.1;

iv. Section 5: a list of the topics covered in the Outline CEMP, and

v. Section 6: an overview of key roles and responsibilities.

2.1.2 Appendix 4.2A: the Outline CEMP setting out details of how the construction of the works will be managed to mitigate impacts on people, communities and the environment. The Outline CEMP includes the following draft Annexes.

i. Annex A – Outline Site Waste Management Plan – used to plan, implement, monitor and review waste minimisation and management on construction sites;

ii. Annex B – Outline Materials Management Plan – to set out how all construction phase materials (materials resources and waste) will be managed by the contractor

iii. Annex C – Outline Logistics Plan – to manage all materials (including material resources and waste) from Scheme conception through to completion;

iv. Annex D – Outline Scheme Asbestos Management Plan – to locate, assess and manage asbestos materials which may be found during the works; and

v. Annex E – Outline Construction Traffic Management Plan – proposed traffic management and maintenance responsibilities during construction of the Scheme.

2.2 The Outline CEMP in Appendix 4.2A of the ES sets out the initial framework for the management of construction related activities likely to have a significant adverse impact on people, local communities and the environment. The Outline CEMP includes general chapters on environmental management and implementation (chapter 3), communications (chapter 4), and general site operations (chapter 5). This is followed by topic specific chapters providing general and specific mitigation measures, monitoring and documentation requirements to manage adverse effects on air quality (chapter 6), cultural heritage (chapter 7), landscape (chapter 8), nature conservation (chapter 9), geology and soils (chapter 10), materials (chapter 11), noise and vibration (chapter 12), all travellers (chapter 13), and road drainage and the water environment (chapter 14).

2.3 As the detailed design is developed, the designers will provide the contractor with construction drawings, schedules and specifications. The contractor in turn will develop their proposals for building the Scheme based on the detailed design, the requirements set out in the Outline EMP/CEMP, their own resources and taking into account matters discussed with the regulatory authorities and local planning authorities. This process is explained in paragraphs 2.2.1 to 2.2.2 in the Outline EMP (Appendix 4.2A of the ES) (Application Document Reference 6-3, APP-299).

2.4 Highways England considers that the level of detail provided in the Outline EMP, incorporating the Outline CEMP, is proportionate given the stage of the project at the time of the DCO Application. Furthermore, Highways England considers that sufficient information on mitigation measures to be implemented during the construction of the Scheme has been provided for the purposes of deciding whether the environmental impacts and risk associated with the Scheme have been identified and that suitable mitigation measures have been proposed to address them.

2.5 Notwithstanding the above, Highways England has made it clear that the level of detail provided in the Outline CEMP is being developed during the detailed design phase. The final CEMP which the statutory environmental bodies and the local planning authorities will be requested to approve under Requirement 8 of the DCO approve will be a more detailed document. Highways England assumes that the final CEMP will not be approved by the relevant organisations until they are satisfied with the level of detail on mitigation measures provided therein and that the construction works will not start until the final CEMP is approved.

2.6 The HEMP is prepared towards the end of the construction period. This document is the main vehicle for transferring essential environmental information learnt during the construction of the Scheme from the contractor to Highways England and the body responsible for the future maintenance and operation of this section of the M4, namely the Managing Agency Contractor ("MAC") for Area 3 (M4 junctions 12 to 5) and the Design Build Finance and Operating Company ("DBFO") that maintains Area 5 (M4 junctions 5 to 3). An indicative outline of the contents of the HEMP is provided in IAN 183/14 Annex C. It is not appropriate at this stage to provide any further guidance on the contents of the HEMP, including any mitigation requirements, as this is dependent on the outcome of the Scheme construction.

2.7 Highways England considers that the purpose of the Environmental Management Plan ("EMP"), the Construction Environmental Management Plan ("CEMP") and the Handover Environmental Management Plan ("HEMP") and how they will interact in their implementation is clear. The EMP sets out the over-arching framework for environmental management during detailed design, construction and operation of the Scheme. The CEMP and the HEMP can be considered as sub-plans to the EMP, focusing on environmental management during two specific phases of the project, that is, (1) construction and (2) commissioning / operation and maintenance. The contractor drafts the CEMP and the HEMP, and is responsible for implementing the CEMP. Highways England is responsible for implementing the HEMP through its Asset Support Contract ("ASC") for Area 3 (M4 junctions 12 to 4b) and the Design Build Finance and Operate ("DBFO") contract that maintains Area 5 (M4 junctions 4b to 3).

2.8 In response to a query from the London Borough of Hillingdon, Highways England confirmed that routing agreements will be included in the Construction Traffic Management Plan ("CTMP") rather than the CEMP. The CTMP would be secured by requirement 18 in the DCO.

3. What progress is being made on planning for the high level survey of closed circuit television (CCTV) locations referred to by the applicant in response to FRQ 4.1.7?

Highways England Response

3.1 The contractor has commenced the procurement of the high level survey of closed circuit television ("CCTV") locations. The contractor is awaiting confirmation of the road space booking and appointment of the survey company.

3.2 Surveys are anticipated to commence in early December, however this is subject to the availability of the road space bookings. The aim is to have the results of the surveys available by mid-February 2016.

4. Paras 4.36 - 4.47 of the NPSNN address climate change adaptation. The applicant has not submitted a report on climate change. To what extent would this add to the evidence submitted through the ES and to the examination?

Highways England Response

4.1 The impact of climate change has been considered during drainage design; as noted in paragraphs 5.2.52 and 5.2.53 of the Planning Statement (Application Document Reference 7-1):

4.2 As stated in paragraph 7.1.2 to 7.1.5 of the Flood Risk Assessment (Application Document Reference 5.3, APP-077), NN NPS UKCP09 50% probability level used against the figures from the 'UK Climate Projections: Briefing report', dated December 2010, indicate that climate change allowance of between 10 to 30% should be used. A 20% allowance for climate change was applied in accordance with the Highways England's guidance document HD33/06.

4.3 A climate change allowance of 20% was therefore applied to the assessment of additional paved areas when designing new or augmenting existing drainage systems affected by increased impermeable as a result of the Scheme (Drainage Strategy Report, paragraph 1.2 3 (Application Document Reference 7-5, App-123)).

5. The NPS NN (ref para 5.16 – 5.19) notes that applicants should consider carbon impacts of a scheme including appropriate mitigation measures. In response to relevant representations REP1-003, the applicant states that the increase in CO_2 attributable to the scheme has been shared with DfT and that DfT has advised that the scheme would not have a material impact on the Government's ability to meet its carbon reduction target. Can the applicant produce the information shared with DfT and DfT's response? Are there any circumstances in which the assessment of CO_2 attributable to the scheme would need to be re-assessed?

Highways England Response

5.1 The information shared with DfT was the appraisal summary table showing changes in carbon (Appendix B of Socio Economic Report); (Application Document Reference 7-2). The responses to representations provided in respect of carbon reflect the agreement struck with DFT. Highways England is currently arranging for the various documents documenting this agreement to be provided to the Examination. It has not been possible to obtain these documents in time for Deadline IV, but Highways England hopes to be in a position to provide them in due course.